The RUBBER AGE

October, 1946

TECHNOLOGY DEPT!

CUMATE

for SPEED and SAFETY

CUMATE used alone or with ALTAX is doing a job in GR-S stocks and in GR-S-natural rubber blends.

Faster Cures...

Fewer Defects...

Good Processing

The list of CUMATE users is steadily increasing

R. T. VANDERBILT CO., Inc.

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TECHNOLOGY DEPT!

LOW HEAT BUILD-UP AND MORE TIRE MILEAGE WITH . . .

ADVANTAGES OF 2-MT OVER THIAZOLES AS SHOWN IN TIRE VULCANIZATES

Rubber stocks accelerated with 2-MT exhibit the following good qualities:

1. **Exceptionally low heat build-up.**
2. **Practically no tendency to revert and exhibit other undesirable effects of long curing.**
3. **Excellent resistance to heat and aging.**
4. **Extraordinary retention of tensile strength, extensibility and resistance to tear, at elevated temperatures.**
5. **Conspicuous resistance to flex cracking.**

Data accumulated from laboratory, plant and road tests prove beyond a doubt that the exceptional quality imparted by 2-MT to natural rubber compounds results in vastly improved truck tire performance. The outstanding advantages of 2-MT are the low heat build-up and the remarkable heat and age resistance that it imparts to stocks without resorting to low sulfur ratios. All of these plus values can be translated into higher mileage and longer life for your tires.

Accelerator 2-MT (thiazoline) shows advantages over MBT (thiazole) similar to those which the thiazoles provided over earlier types of accelerators.

The structural formula of 2-MT shown above reveals some relationship to mercapto benzo thiazole, but in its behavior the following favorable differences will be observed:

1. At vulcanizing temperatures below 267°F. its speed and strength are equal but at higher temperatures it is a slightly stronger and faster accelerator.
2. The modulus curve of stocks accelerated with straight 2-MT is slightly steeper. However, when the 2-MT is activated with a guanidine or an aldehyde amine, the modulus curve is flatter.
3. 2-MT is less acidic than MBT. Consequently it can be activated with guanidines or aldehyde amines with greater safety at processing temperatures.
4. Also because 2-MT is less acidic, the use of Retarder W or other organic acids such as stearic acid has greater retarding effect at processing temperatures. However, at vulcanizing temperatures (above 267°F.) this action is reversed and Retarder W activates acceleration.

Although rubber compounds having the most desirable physical qualities will be obtained by the use of 2-MT without secondary acceleration, activation with a guanidine or with an aldehyde amine such as Accelerator 808 results in faster cures.

Rubber Chemicals Division

E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

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. . . THROUGH CHEMISTRY

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THE RUBBER AGE, published monthly by The Palmerton Publishing Co., Inc., Printing Office, East Stroudsburg, Pa. Editorial and Advertising Offices at 250 West 57th Street, New York 19, N. Y. Entered as second class matter October 20, 1933, at the Post Office at East Stroudsburg, Pa., under the Act of March 3, 1879. Subscription in United States, $3.00 a year; Canada, $3.50; Foreign, $4.00. October, 1946. Vol. 60, No. 1.

TECHNOLOGY DEPT!

HYCAR for Color

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These household products are representative of the wide variety of articles that may be made in brilliant or delicate colors from HYCAR synthetic rubber. And—adequate quantities of HYCAR are now available. For colored sample of compounded stocks, or for color compounding information, please write Dept. HD-10, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

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B. F. Goodrich Chemical Company

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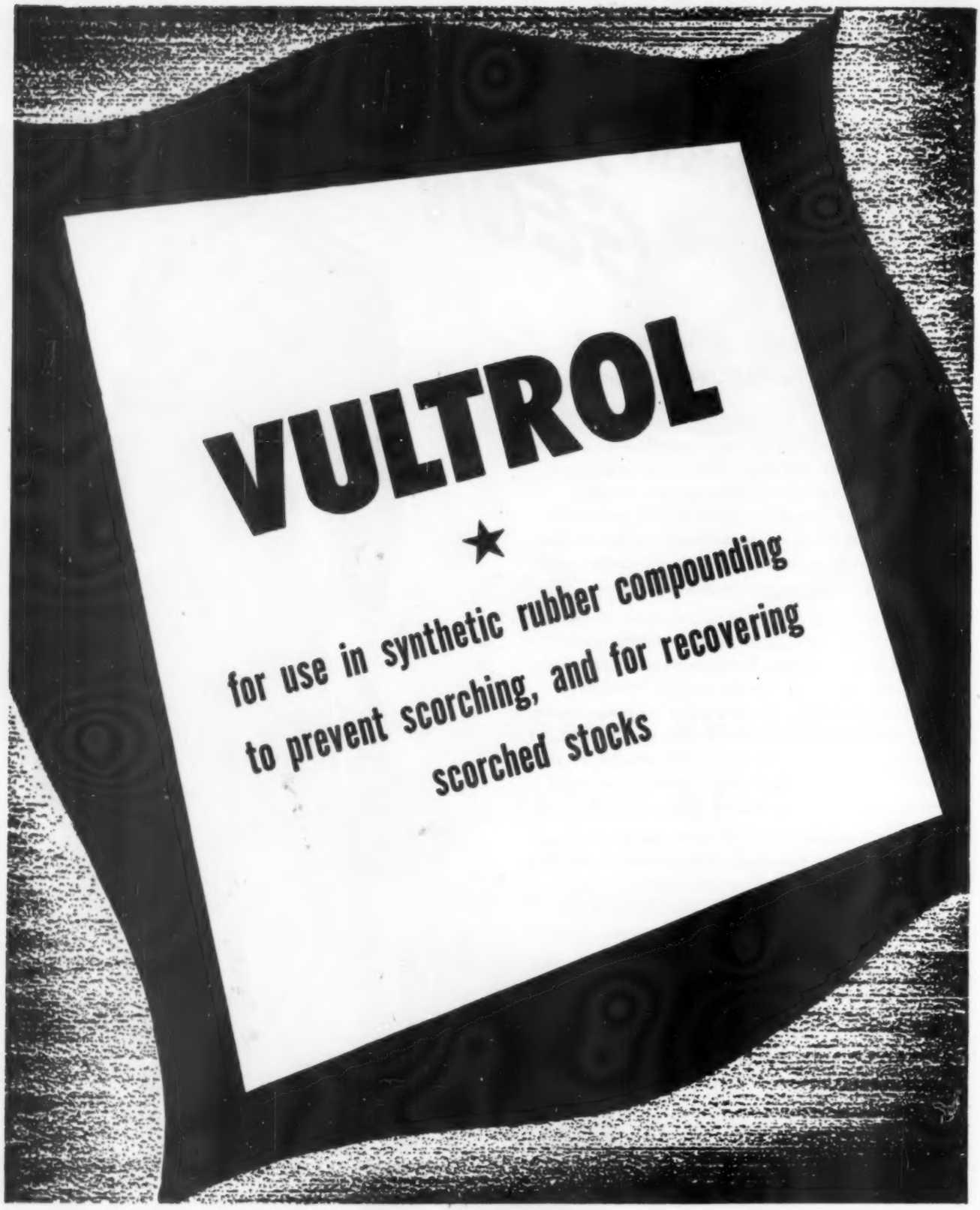

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FOR BETTER MOLDED AND EXTRUDED GOODS

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It acts as a plasticizer at processing temperatures, assuring more uniform, more easily handled compounds. It positively reinforces stocks, imparting additional hardness with little loss in elongation. Excellent abrasion resistance and good flex-life.

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NO, it isn't actually made of rubber. But this Taylor Platen Press Control System is flexible enough to mold almost any kind of mechanical rubber goods. It's particularly adaptable to short runs of products where the cure cycles vary.

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1. Total cycle is adjustable through the adjustable speed gear train—78 different drum speeds.

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3. Auxiliary timer permits cure period to be adjusted independent of other sequence periods.

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Operation is completely automatic from the time you push the button until the press opens for the next load. Ask your Taylor Field Engineer or write Taylor Instrument Companies, Rochester, N.Y., or Toronto, Canada: *Instruments for indicating, recording, and controlling temperature, pressure, humidity, flow and liquid level.*

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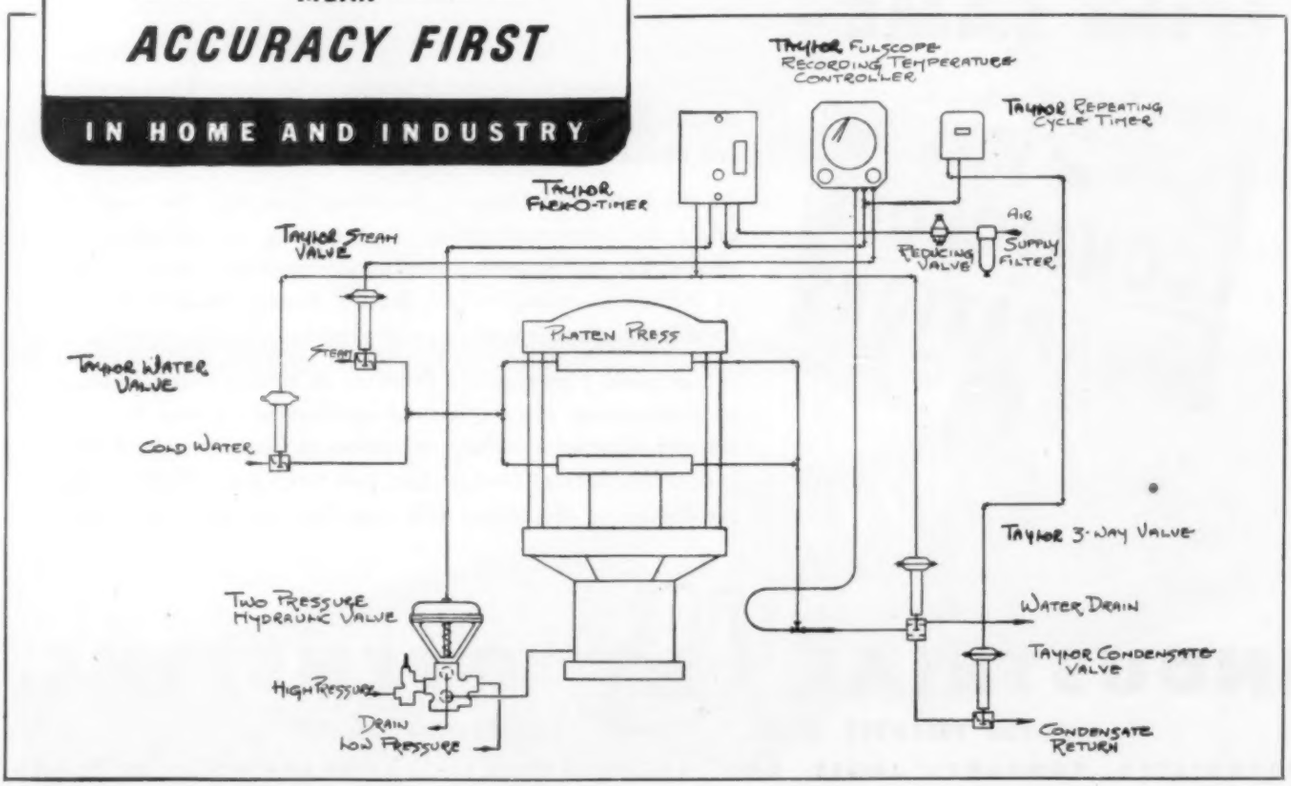

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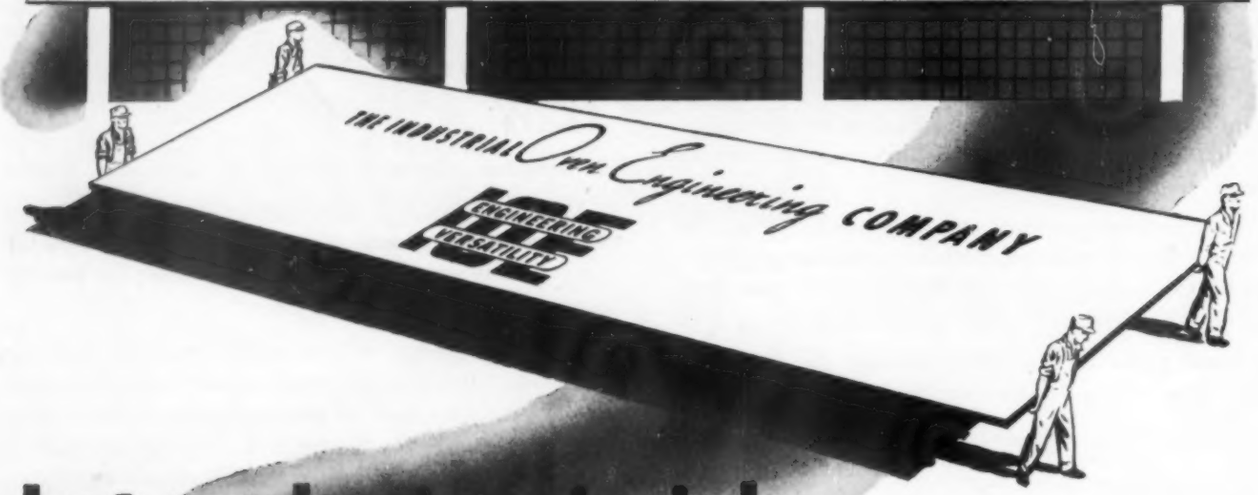
INDUSTRIAL IOI OVENS, INC.



but our basic principle is the SAME—

We've changed our name to Industrial Ovens, Inc. to define more clearly the scope of our service to industry. That service consists of the engineering, design and installation of systems and equipment for oven treating and processing operations.

As the Industrial Oven Engineering Company this organization has been responsible for increasing and speeding up production and lowering production costs in a wide range of industries—wire, rubber, textile, plastic, ceramic, metal finishing and many others.

If you have a production problem involving oven treating or processing, *the engineered application of heat in continuous material-handling operations* can help you—and that means Industrial Ovens, Inc. can help you. Write today for literature describing IOI installations in your field.

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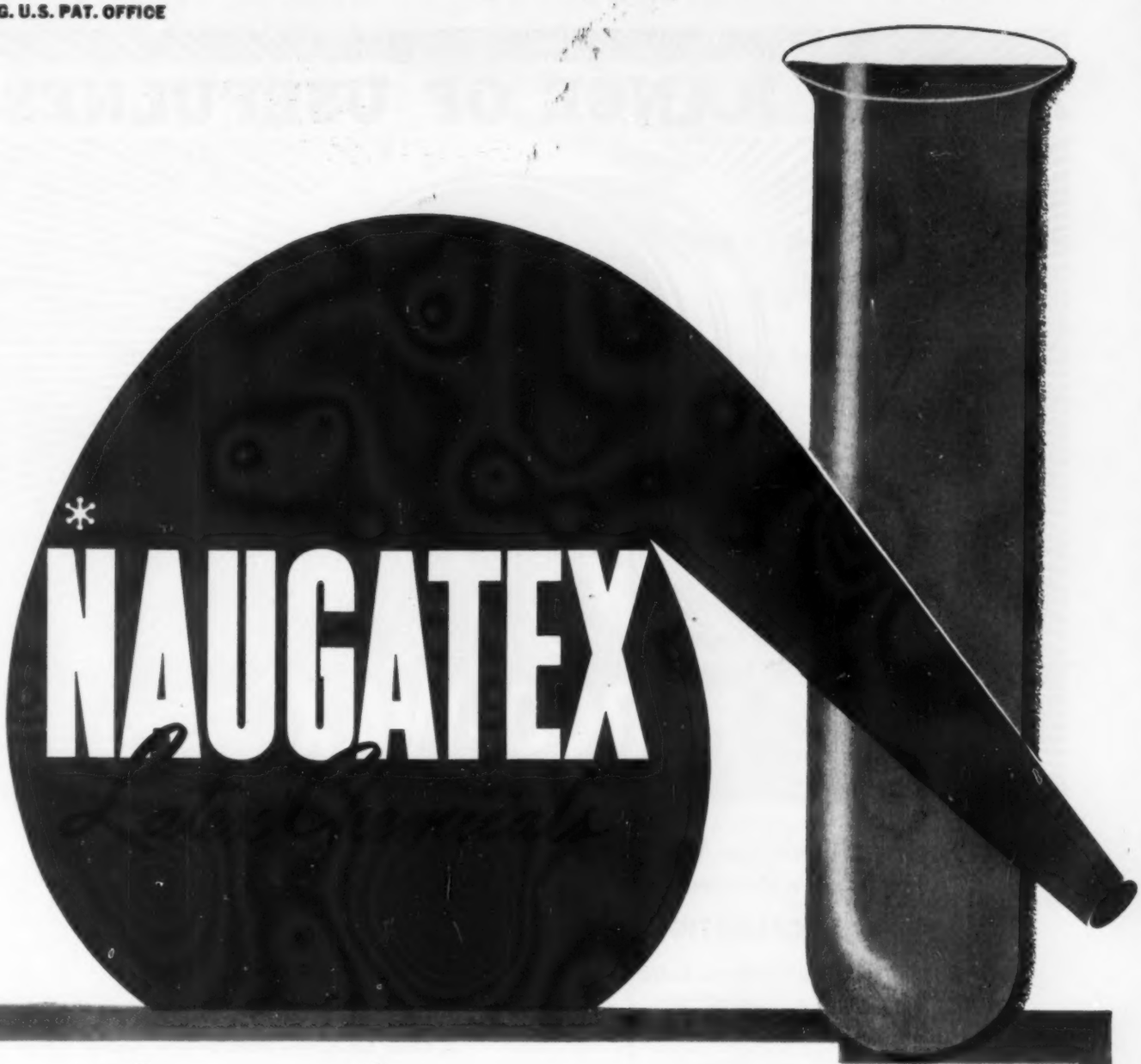

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A Plasticized Petroleum Wax To Promote Efficiencies In Processing.

CHARACTERISTICS

Physical appearance	—Semi-Solid
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Color	—Gray
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HERCO WAX is a scientific blend of petroleum oil and petroleum wax designed as a processing aid at low material cost. It is a two-in-one material streamlined to carry out one of the oldest compounding functions with a very definite added convenience.

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8. Available
9. Low cost

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For samples and compounding information on softening oils and waxes please write to Herron Bros. & Meyer —Our Technical Representative will be glad to call on you.

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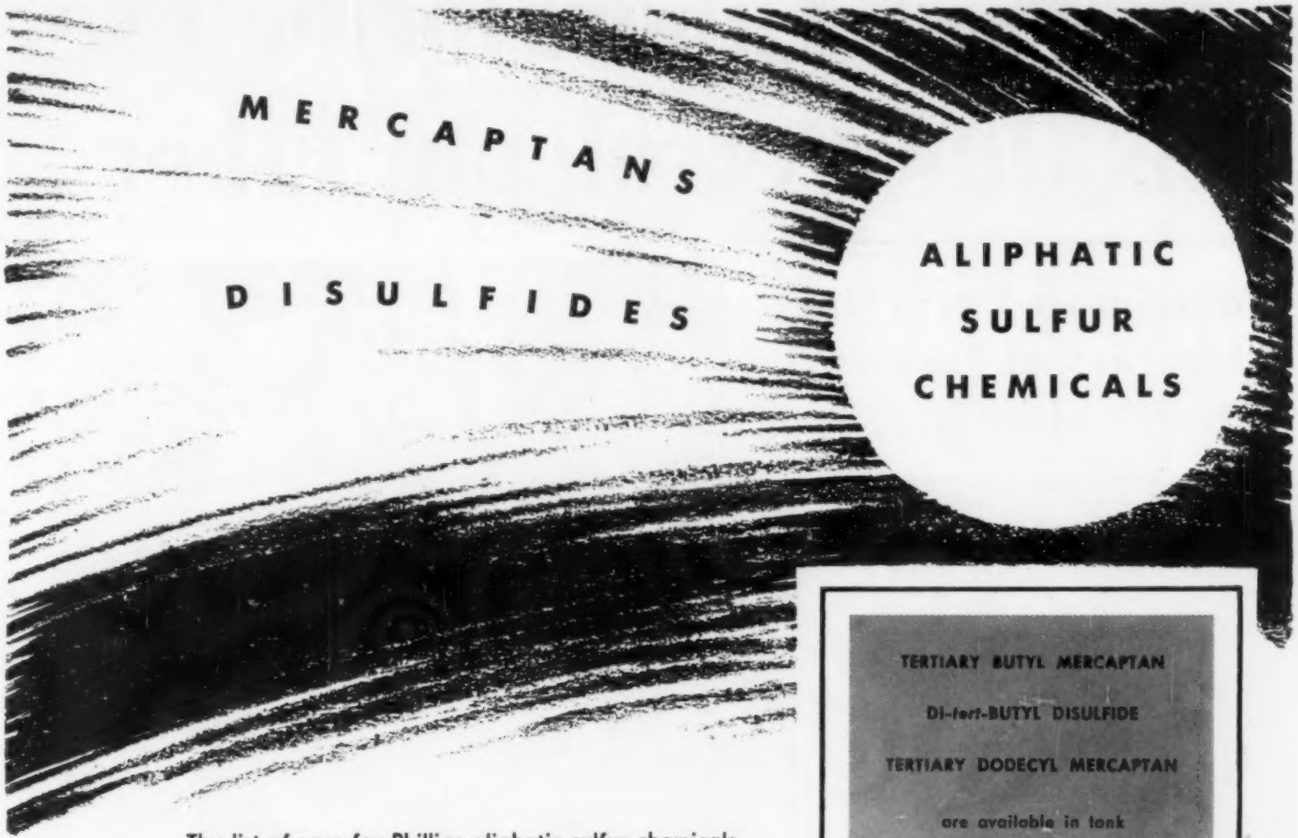

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Di-*tert*-BUTYL DISULFIDE

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are available in tank car quantities.

The following are available in experimental quantities:

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- Tertiary Octyl Mercaptan
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- Tertiary Hexadecyl Mercaptan
- Di-*tert*-Amyl Disulfide
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- Di-*tert*-Butyl Polysulfide

The list of uses for Phillips aliphatic sulfur chemicals is long and still growing. This entirely new series of chemicals from petroleum offers interesting possibilities in experimental and industrial processes. Phillips engineers would like to discuss with you their advantages in relation to your finished product.

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Additives for oils . . . Odorants for gas . . . Polymerization modifiers . . . Intermediates for chemicals . . . Pharmaceuticals . . . Insecticides and fungicides . . . In dyestuffs and intermediates . . . In adhesives . . . Additives in rubber and plastics; alcohol denaturants; pickling inhibitors; lubricating oils.

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PHILLIPS PETROLEUM COMPANY

Chemical Products Department

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To Maintain Unvarying Accuracy of Findings Month after Month!

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Chemists making tests requiring the use of petroleum ether face this peculiar problem—petroleum ethers and other petroleum naphthas of the same boiling range probably will vary in chemical composition if obtained from different sources.

Because petroleum fractions are composed of many different compounds, differing in solvency, gravity, odor, and other qualities, tests made with two petroleum ethers of the same boiling range may have different results.

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To meet this problem, most laboratories standardize on Skellysolve "F"—the first petroleum ether made to meet the new specifications of the American Oil Chemists' Society—and the one used by the majority of referee, commercial and industrial laboratories in the oil and fat industry.

If you use petroleum ether, you can eliminate one possible variable in your test conditions by standardizing on Skellysolve "F".

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Where service requirements for vinyl compounds are toughest, you'll want the outstanding permanence, non-migratability and ultraviolet resistance of Paraplex G-25. Coated fabrics, upholstery, simulated leather, luggage and free films are but a few of the many uses for this unique resinous plasticizer.

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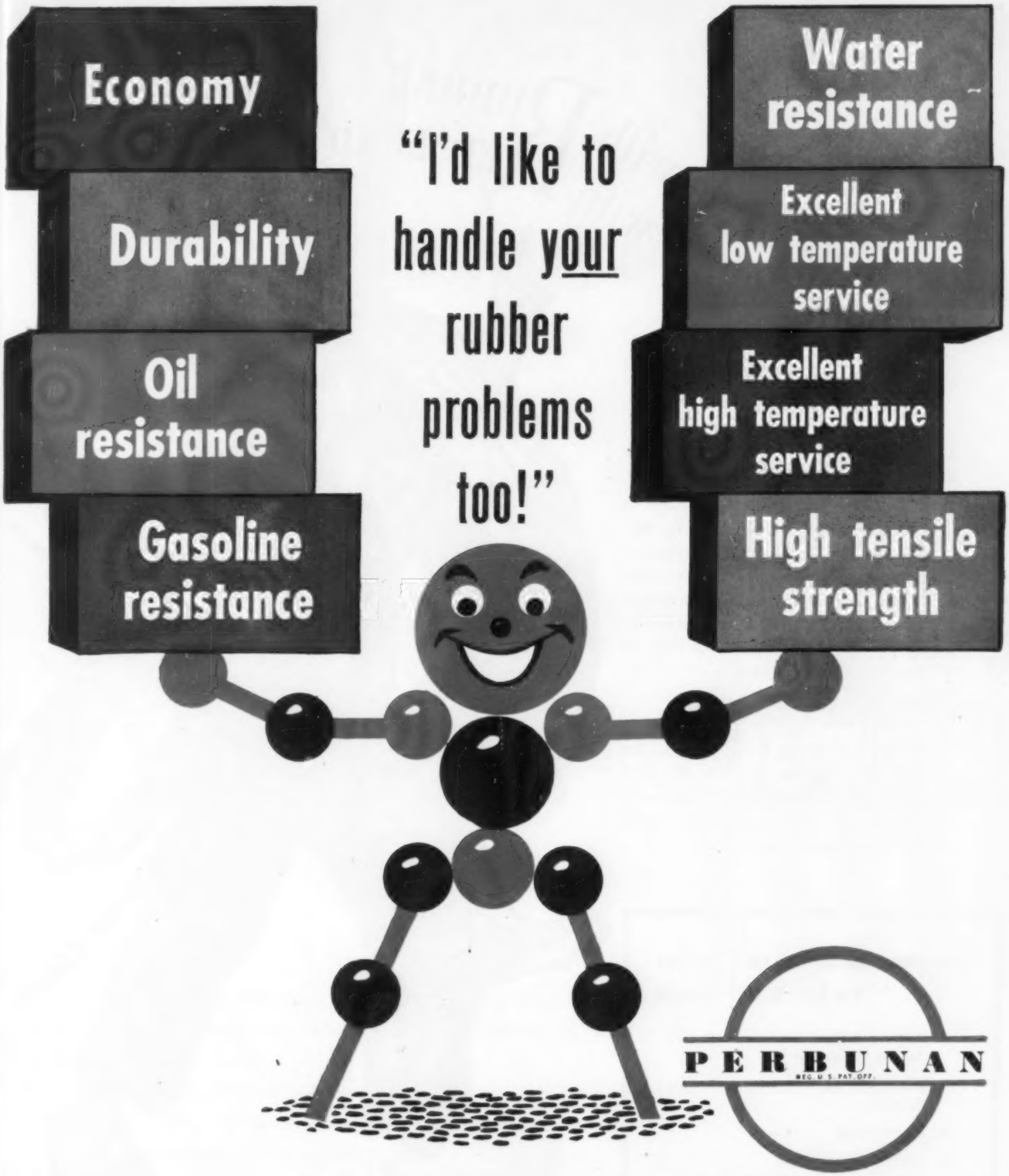

The outstanding features of Perbunan Synthetic Rubber qualify it to handle tough rubber compounding problems. It has proved the answer for rubber compounders time and time again . . . and never-ending research keeps Perbunan geared to current rubber compounding practices.

Stanco Rubber Technologists are ready to help you. *They can offer specific compounds designed for specific jobs!* Call on them and discover the economy and efficient service of Perbunan Synthetic Rubber.

THE SYNTHETIC RUBBER THAT RESISTS OIL, COLD, HEAT AND TIME

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It's true of nearly every product... tires or toys or duck decoys...*if it's made with Rubber, it's better made with Red Lead.*

Extensive tests... confirmed by the experience of users... have established that compounding rubber with #2 RM Red Lead offers the definite advantages listed below. Some of these benefits apply to *your* business—regardless of whether you are working with GR-S, GR-S-10, GR-M, GR-A, GR-I, natural rubber or vinyl elastomers.

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This formulation of Monsanto Lampblack has demonstrated *definite superiority in smoothness . . . with far less friction, less heat "build-up" . . .* especially where flexing is a factor. (For example: in an automobile tire it is estimated that the rubber is flexed 15 million times in 20,000 miles!) Monsanto Lampblack No. 10 has a maximum degree of purity and carbon content (Typical analysis: Free Carbon, 99.29%).

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DUTREX 6

Plasticizer and extender for GR-S and natural rubber.

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Plasticizers and extenders for vinyl chlorides and acrylonitrile rubber.

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Plasticizer and softener for GR-S and natural rubber.

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Tackifier and plasticizer for acrylonitrile rubber.

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Heavy process oil for GR-S and natural rubber.

DUTREX 30

Light process oil for Neoprene.

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Physically Controlled

SHELL'S service to the rubber and plastics industries is based upon the development research and the product control afforded by the rubber and plastics laboratories of Shell Development Company.

Samples of each batch of Dutrex are analyzed, then compounded into finished rubber or plastics. Complete tests are run on these control compounds. *Batches of Dutrex are not released until the performance of the finished compound is known.*

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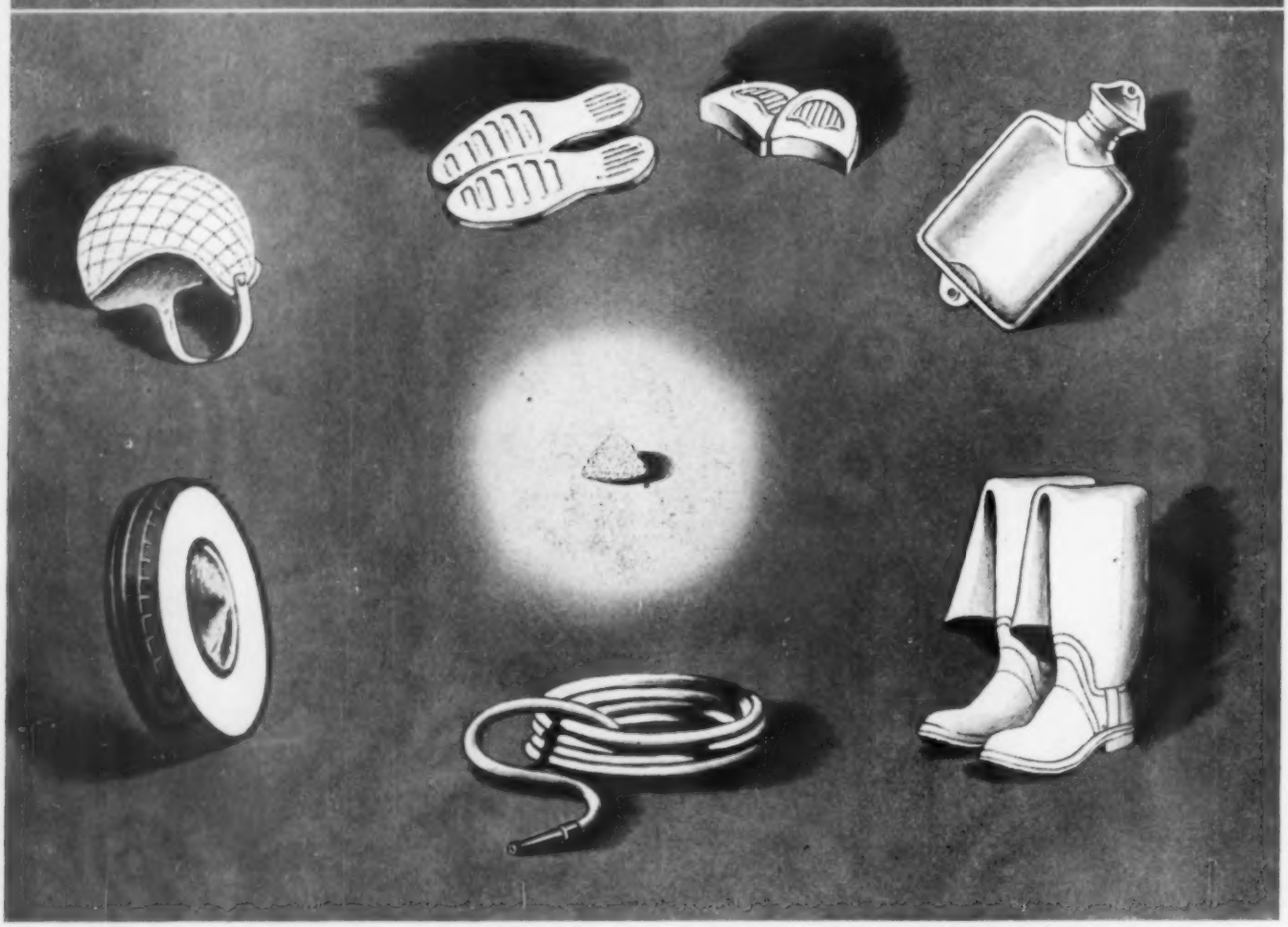
TITANOX ... *the brightest name in titanium pigments*



a little TITANOX does a lot of WHITENING!

The whitening and brightening effect of TITANOX pigments makes possible the highest degree of whiteness obtainable in rubber stock. Furthermore, because of the high tinting strength of TITANOX, any desirable degree of whiteness can be attained with a proportionate minimum of pigmentation.

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To tinted stocks, TITANOX pigments impart clarity of color and tone.

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BIBLIOGRAPHY OF RUBBER LITERATURE

for 1940-1941

CONTENTS

Foreword — Committee Statement
Preface — Journal Abbreviations
Abstracts in 65 Sections
Author Index — Subject Index
6 x 9 in. — Cloth Bound — 296 pp.

THIS new bibliography, covering the years 1940 and 1941, is the Fifth in a series inaugurated by RUBBER AGE with the edition covering the year 1935. Succeeding editions covered 1936, 1937 and 1938-1939.

The series was dropped during the war but it has now been taken over by the Division of Rubber Chemistry, American Chemical Society. The Division appointed a Bibliography Committee in 1943, consisting of Messrs. C. C. Davis, M. E. Lerner, C. W. Christensen and Dr. John McGavack, Chairman. After the committee made an investigation and found that rubber technologists in general favored the continuation of the bibliography, the Division authorized the committee to proceed with the compilation and publication of an edition covering 1940 and 1941.

The present volume is the result of the efforts of the committee. The size, 296 pages, is evidence of the large amount of work published during the period covered by the volume and of the diligence of the Committee in compiling and abstracting these published results. Not only have all references on rubber appearing in hundreds of technical journals been compiled but references to hundreds of patents relating to rubber and rubber compounds are included in each reference, a feature not found in earlier editions.

In a statement appearing in the foreword, the committee stated, "We feel this book will meet the need of rubber chemists in their usual day to day job." Research engineers, librarians and others will also find this book an invaluable source of information.

It is expected that succeeding volumes will also cover 2-year periods until it is possible to issue annual editions so that they will appear within a comparatively few months after the end of each year.

NOTE: One copy of this book has been sent, without charge, to each member of the Division of Rubber Chemistry, A. C. S. Additional copies may be purchased as noted below.

•

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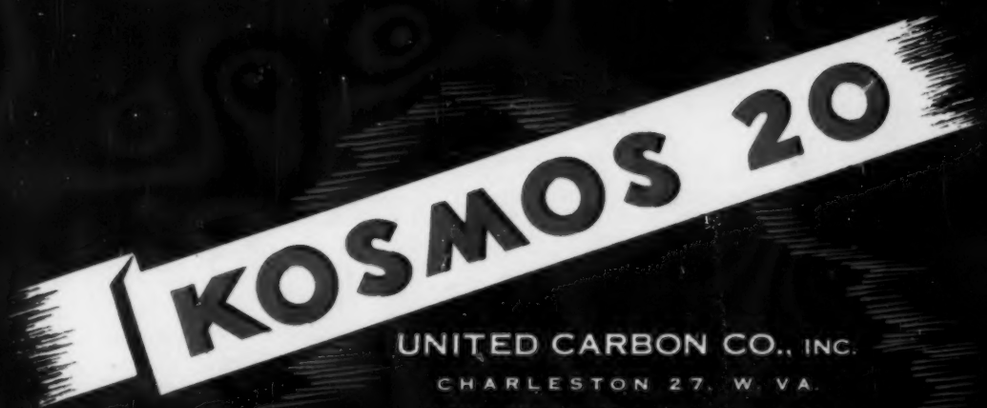

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KOSMOS 20

In SRF black there should be a perfect balancing of all the component properties contributing to rubber performance. UNITED with the "know-how" and engineering skill have achieved this perfect balance in KOSMOS 20. With it you obtain ease and smoothness of processing, the proper degree of semi-reinforcement, low heat generation, maximum resiliency, best aging and non-staining.

The wise compounder insists
on KOSMOS 20.

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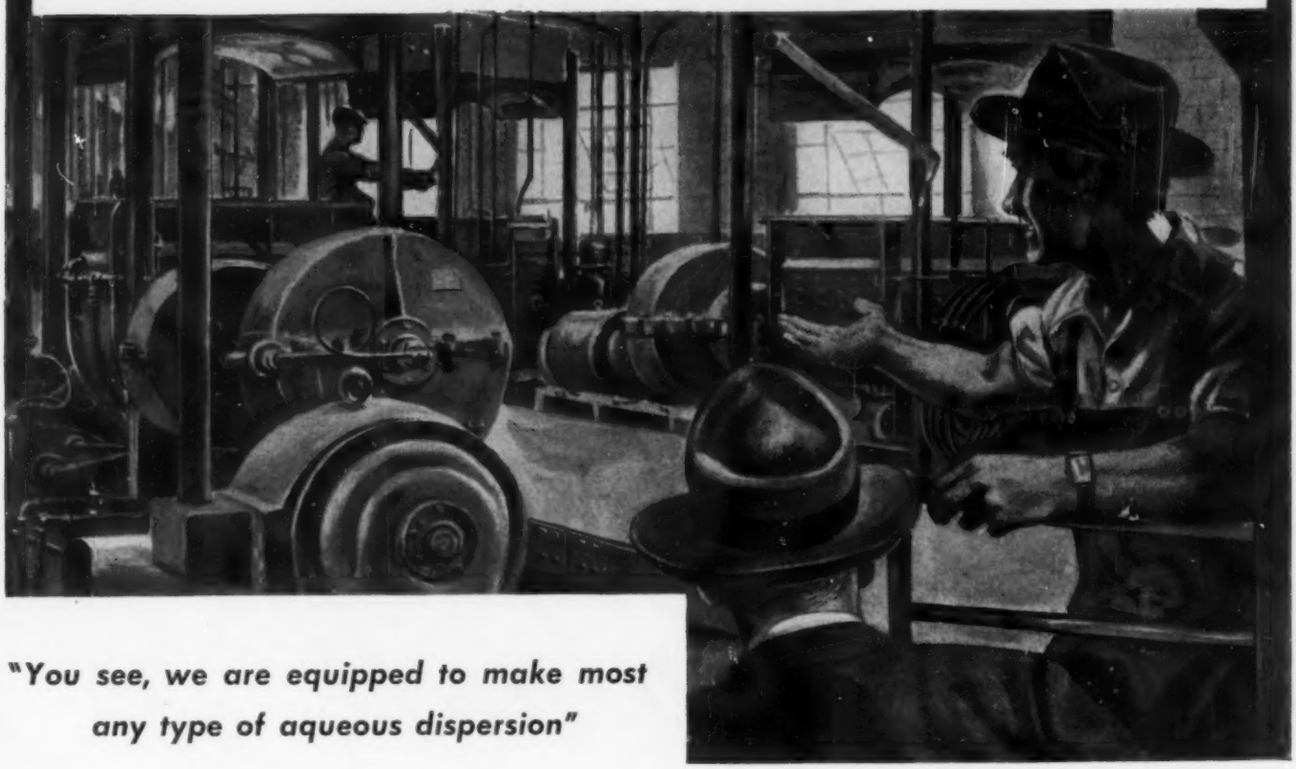
Does your job call for Aqueous Dispersions of Rubber?...

[FLINTKOTE PROVIDES A PRODUCT TO MEET MOST REQUIREMENTS]



"You see, we are equipped to make most any type of aqueous dispersion"

If you are faced with a problem involving a water dispersed rubber or resin . . . put it up to Flintkote.

You'll find Flintkote technical representatives—backed by half a century of research and practical experience — ready and able to take care of your every need. The chances are, these men can suggest an available Flintkote product . . . the one which is best suited to your needs.

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The wide range **of Flintkote Syntex* products includes aqueous dispersions of rubbers and resins for impregnating, sizing, coating . . . and many other uses. Also, Flintkote makes protective coatings for steel and masonry exposed to weather or corrosion . . . anti-slip floor coatings . . . asphalt emulsions for mastic floorings, paper sizing, industrial adhesives and many specialties.**

**Reg. U. S. Trade Mark of Flintkote's Rubber Dispersions*

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A practical approach to the use of synthetic dispersions in your product is to refer your problem to our laboratory. No matter what the process—coating, impregnating, or bonding—our experienced technical staff can compound the material best suited to your requirements. In the case of an entirely new product, we will work out all the details of manufacturing procedure—from pilot operations to commercial production in your plant. Why not talk it over with one of our technical representatives?

GRS latex types 2 and 3, normal and concentrated, available from stock.

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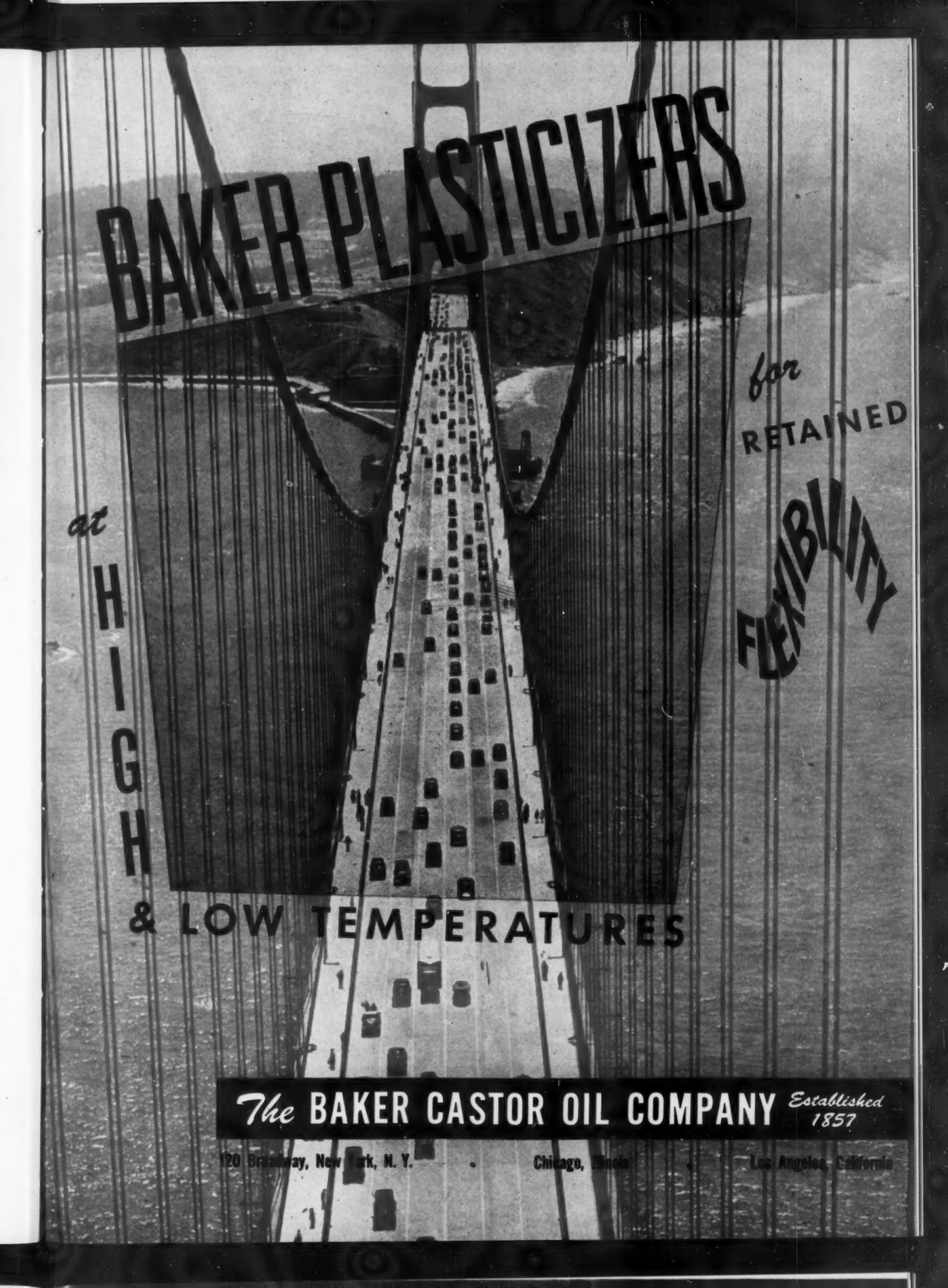
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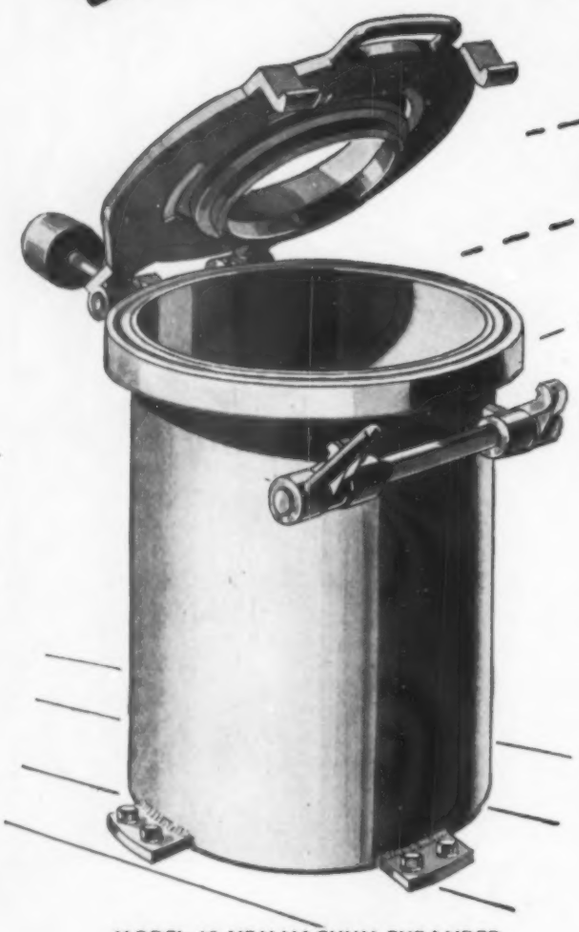
NEW MODEL NRM VACUUM EXPANDER for small diameter tires



MODEL 40 NRM VACUUM EXPANDER —Tire Size Capacity OD Max. 24", Rim Diameter size 4" to 12", stroke 17½" (cross section approx. 8" depending on rim diameter.) Hydraulic cylinder extends below floor level approx. 24".

THE trend is toward smaller diameter tires. Rim sizes for new passenger cars are to be still further reduced. Small planes, industrial trucks and other equipment are requiring an increasing volume of small tires with rim diameter sizes as small as 4".

For the bagging and shaping of these special purpose tires, NRM has designed a new model Vacuum Expander ideally suited for this work.

Compactly designed, the unit requires a floor area only 29" x 29", working surface is 32½ inches high for convenient operation.

Now is the time to check your production capacity on the smaller diameter tires, then if you find you are under-equipped to meet the fast-growing demands for these types of tires, write NRM for complete engineering data on this new Vacuum Expander Unit.

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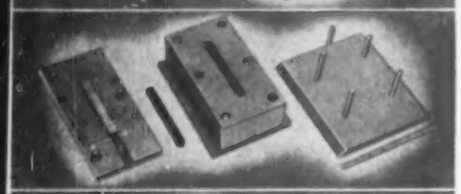

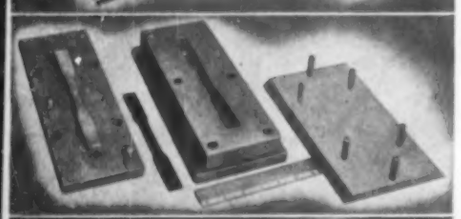

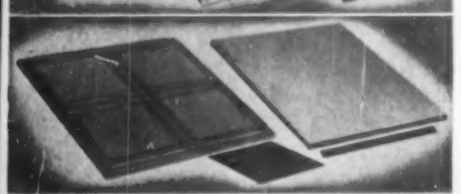

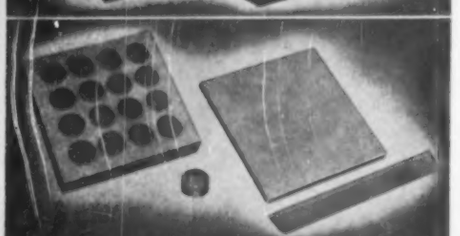

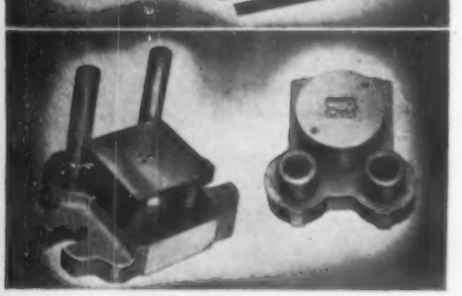

These molds are "PRECISION" Engineered for speedy operation, are durably constructed of high quality tool steel and are made to extremely close tolerances.

Cat. No.	ASTM Specifications	Purpose	Size
13450	D 429	Adhesion test disc mold—For testing adhesion of rubber to metal—Four cavity—Chrome plated	3/4" thick x 1 3/8" diameter (2 sq. in. area)
13451	D 731	Cup mold—For flow tests—Single cavity—Chrome plated	2.300" high 2.200" outside top diameter 1.750" outside bottom diameter
13464	D 395 D 531 D 676 D 297	Compression fatigue disc specimen mold—Can also be used for Compression set tests, hardness tests, resilience tests, specific gravity tests—16 Cavity—Chrome plated	1/2" thick 1.129" diameter (1 sq. in. area)
13453	D 647 Fig. 3	Dielectric strength disc specimen mold—Can also be used for Power factor tests—Single cavity—Unplated	.750" thick 4" diameter
13455	D 552	Disc specimen mold—For sponge rubber—Four cavity—Chrome plated	6" x 6" x 1/2"
13452	D 647 Fig. 3	Disc specimen mold—Can also be used for Water absorption test—Single cavity—Chrome plated	.750" thick 2" diameter
13462	D 647 Fig. 2	Flexural test specimen mold—Can also be used for Impact test—Single cavity—Chrome plated	1/2" x 1/2" x 5"
13451	D 731	Flow test mold—Can also be used for Plastics molding powders—Single cavity—Chrome plated	2.300" high 2.200" outside top diameter 1.750" outside bottom diameter
13462	D 647 Fig. 2	Impact test specimen mold—Can also be used for Flexural tests—Single cavity—Chrome plated	1/2" x 1/2" x 5"
13432		Miscellaneous mold—For rubber—Single cavity—Chrome plated	12" x 12" x 1/4"
13433		Miscellaneous mold—For rubber—Single cavity—Chrome plated	12" x 12" x 1/2"
13434		Miscellaneous mold—For rubber—Single cavity—Chrome Plated	12" x 12" x 1/8"
13435		Miscellaneous mold—For rubber—Single cavity—Chrome plated	2.5" x 1.75" x .025"
13436		Miscellaneous mold—For rubber—Single cavity—Chrome plated	2.5" x 1" x .025"
13437		Miscellaneous mold—For rubber—Single cavity—Chrome plated	3" x 4" x 1/8"
13439		Miscellaneous mold—For rubber—Four cavity—Chrome plated	2" x 8" x 1/8"
T4935	D 617	Punch tool—For punching quality tests (plastics)—Chrome plated	
15225	D 732	Shear tool—For testing shear strength—Chrome plated	1" diameter punch
13432		Slab mold—For rubber—Miscellaneous—Single cavity—Chrome plated	12" x 12" x 1/4"
13433		Slab mold—For rubber—Miscellaneous—Single cavity—Chrome plated	12" x 12" x 1/2"
13434		Slab mold—For rubber—Miscellaneous—Single cavity Chrome plated	12" x 12" x 1/8"
13457	D 638 Fig. 1	Tensile specimen mold—Type 1—Single cavity—Chrome plated	1/4" thick and under
13459	D 638 Fig. 1	Tensile specimen mold—Type 1—Single cavity—Chrome plated	1/4" to 1/2" thick inclusive
13461	D 638 Fig. 1	Tensile specimen mold—Type 1—Single cavity—Chrome plated	1/2" to 1" thick inclusive
13460	D 638 Fig. 1	Tensile specimen mold—Type 2—Single cavity—Chrome plated	1/4" to 1/2" thick inclusive
13458	D 638 Fig. 1	Tensile specimen mold—Type 2—Single cavity—Chrome plated	1/4" thick and under
13467	D 638 Fig. 1	Tensile specimen mold—Type 2—Single cavity—Unplated	1/4" to 1/2" thick inclusive
13430	D 15	Tensile specimen mold—Single cavity—Chrome plated	6" x 6" x .075"
13431	D 15	Tensile specimen mold—Four cavity—Chrome plated	6" x 6" x .075"
13463	D 647 Fig. 4	Tensile specimen mold—For dog bone tensile test specimens—Single cavity—Unplated	
13452	D 647 Fig. 3	Water absorption test specimen mold—Single cavity—Chrome plated	.750" thick 2" diameter

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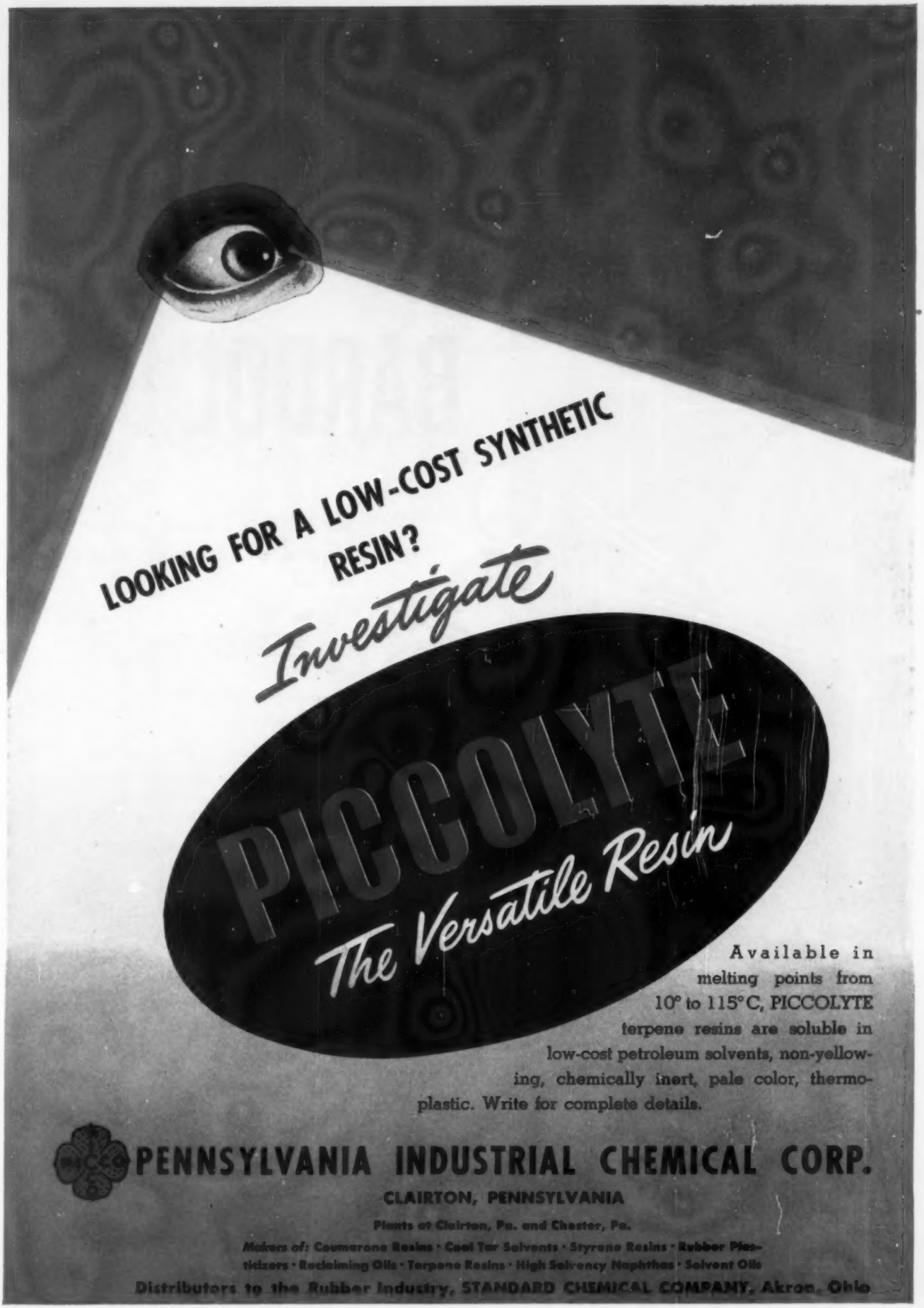
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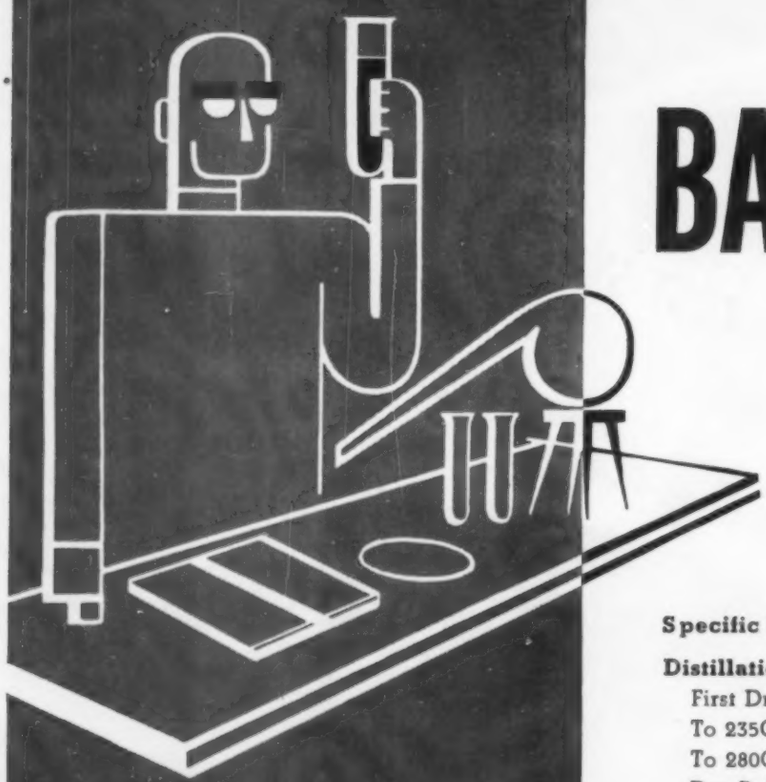

BARDOL* B

Bardol B is a clear, yellow liquid product of coal-tar oil.

SPECIFICATIONS

Specific Gravity	@ 25°C/25°C	1.00 to 1.04
Distillation		
First Drop	Deg. Cent.	230.0 minimum
To 235C	% by volume	5.0 maximum
To 280C	"	90.0 minimum
Dry Point	Deg. Cent.	310.0 maximum
Water	% by volume	0.2 maximum

Bardol B is a specially refined coal-tar fraction designed primarily for light-colored goods. It is a particularly fine plasticizing oil. Bardol B is recommended for use with crude rubber, GR-S, GR-A(Buna N), GR-M(Neoprene), GR-P(Thickol) and for reclaiming light-colored goods.

Available in: 50-55 gal. non-returnable steel barrels.

*Reg. U.S. Pat. Off.

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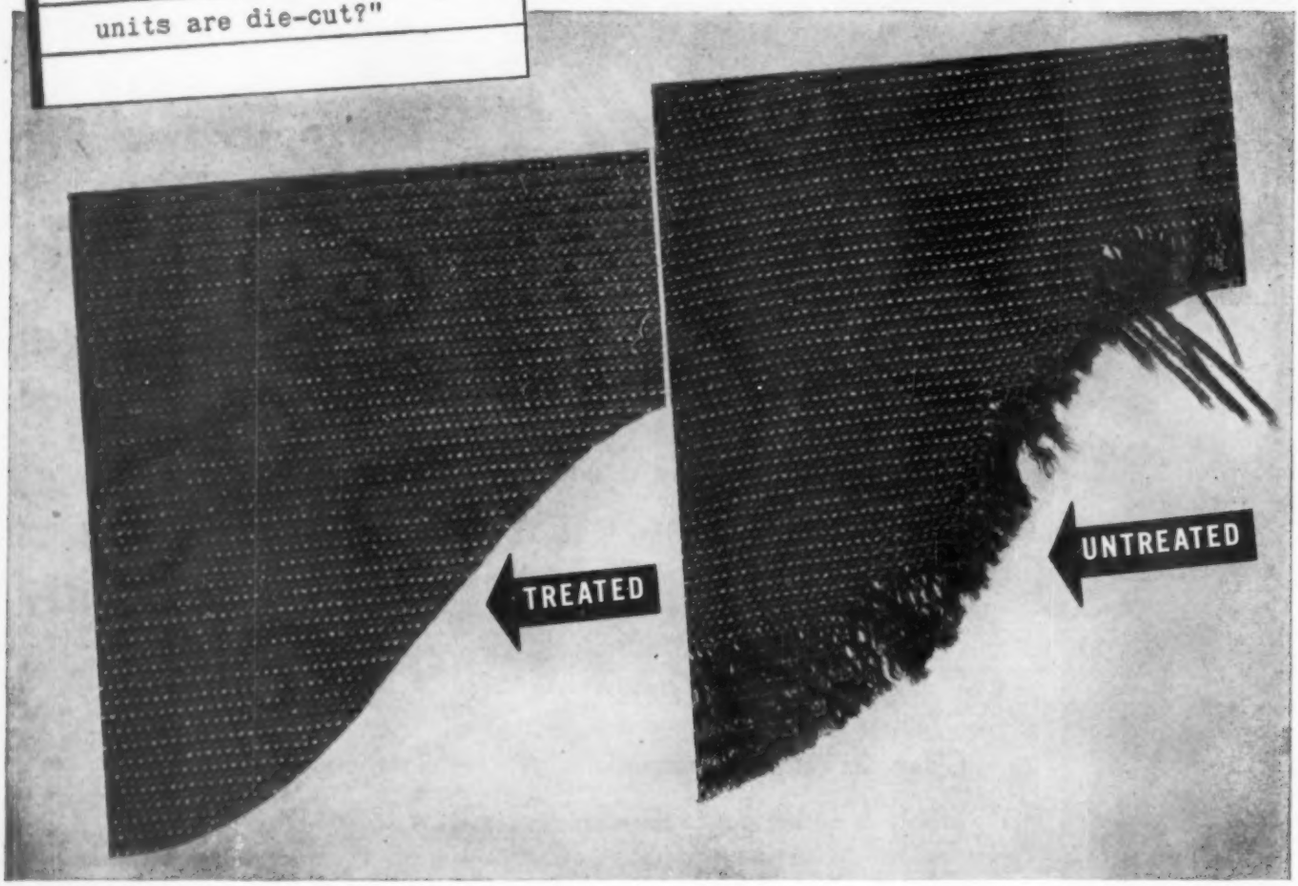

Ubatex, used as a fabric coating, permits die-cutting of irregular fabric units for shoes, pocketbooks and similar products without fraying; leaves all edges clean-cut. A latex-like emulsion of plasticized polystyrene, Ubatex is applied by conventional coating machines, gives a flexible, supple film. It in no way affects the "hand" of the original fabric, and having a dry surface, presents no blocking problems in multiple cutting or packing. UBS may have the answer to your coating problem.

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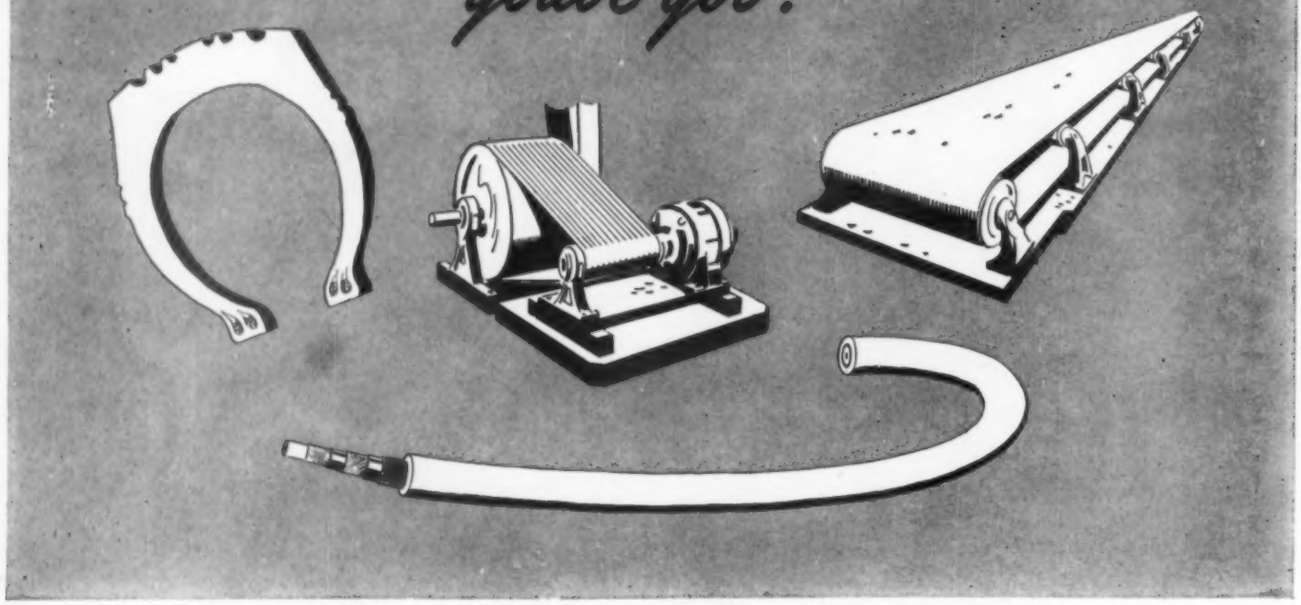
the toughest wire-in-rubber problem you've got!



EXACTLY. If you have a tough problem involving the application of wire to rubber . . . or if you need to find just the *right* wire for the results you want, we offer you our help.

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. . . WIRE FOR TIRES—braided wires, wire tape and single wires, and cost-saving application machinery—developments that go far today in making bead failures a rarity . . .

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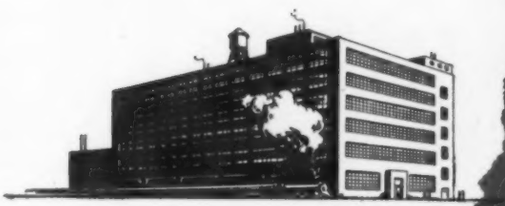

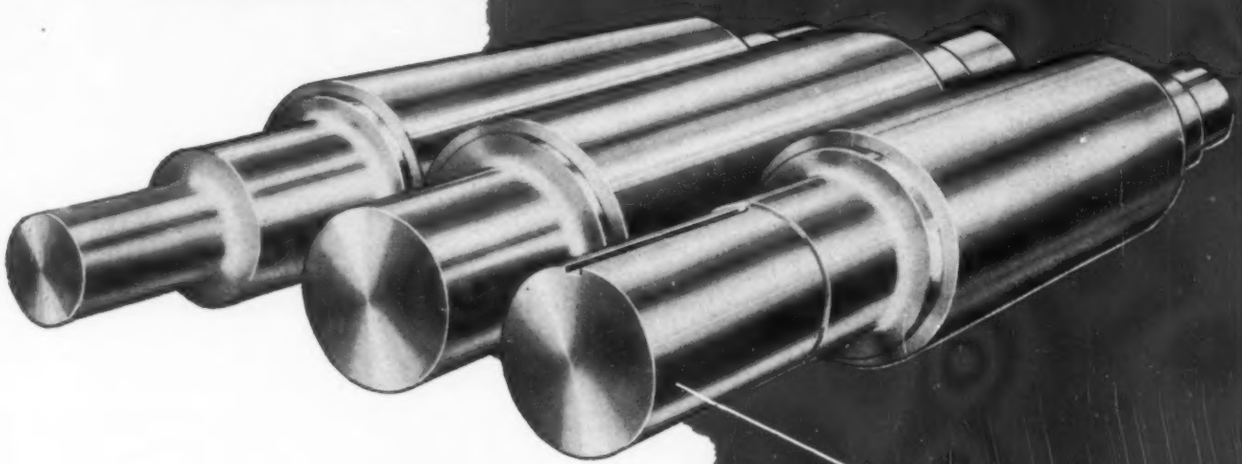

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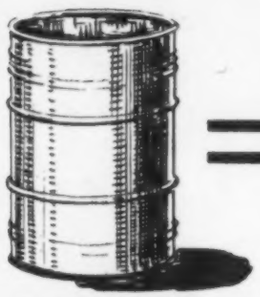

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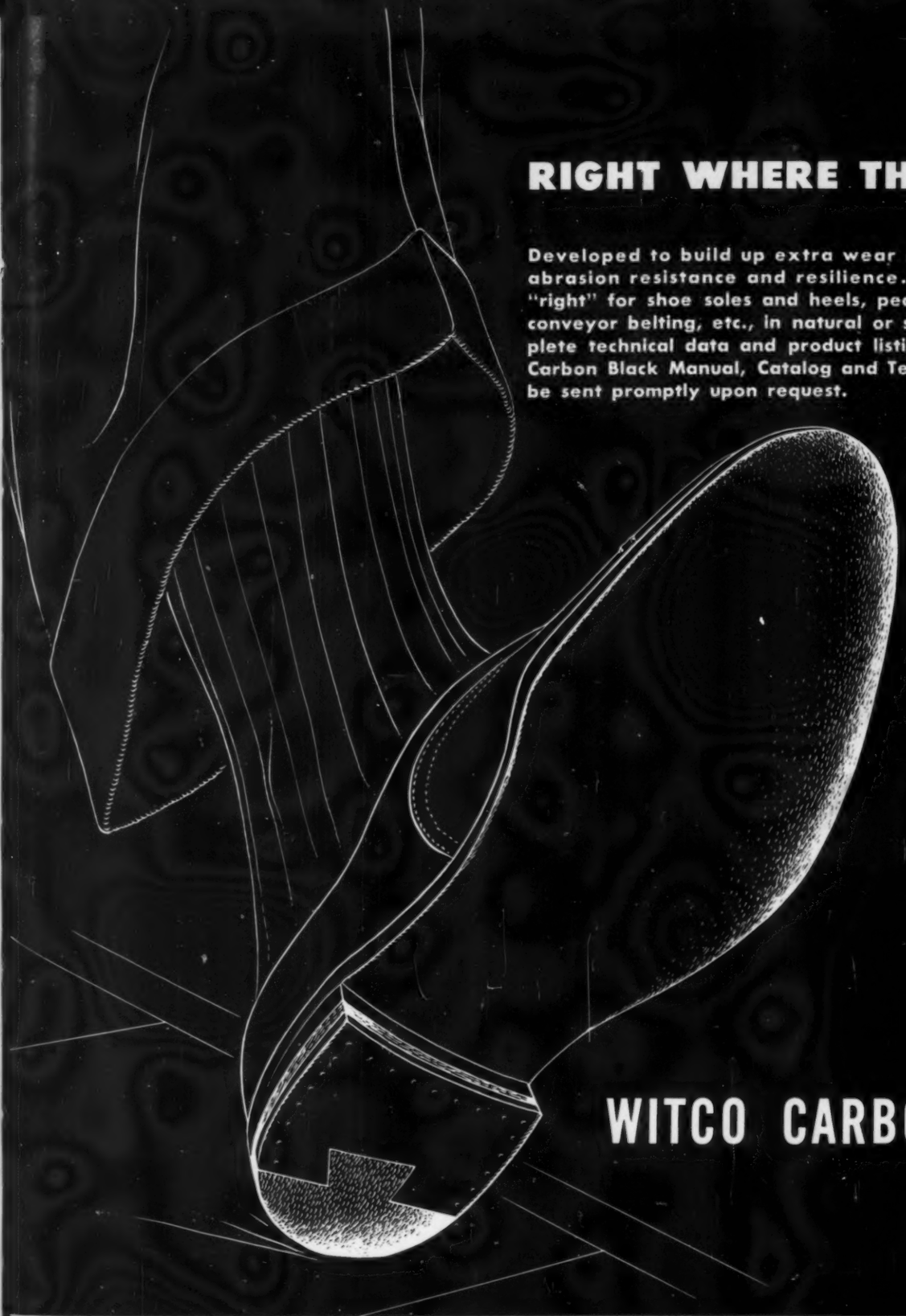

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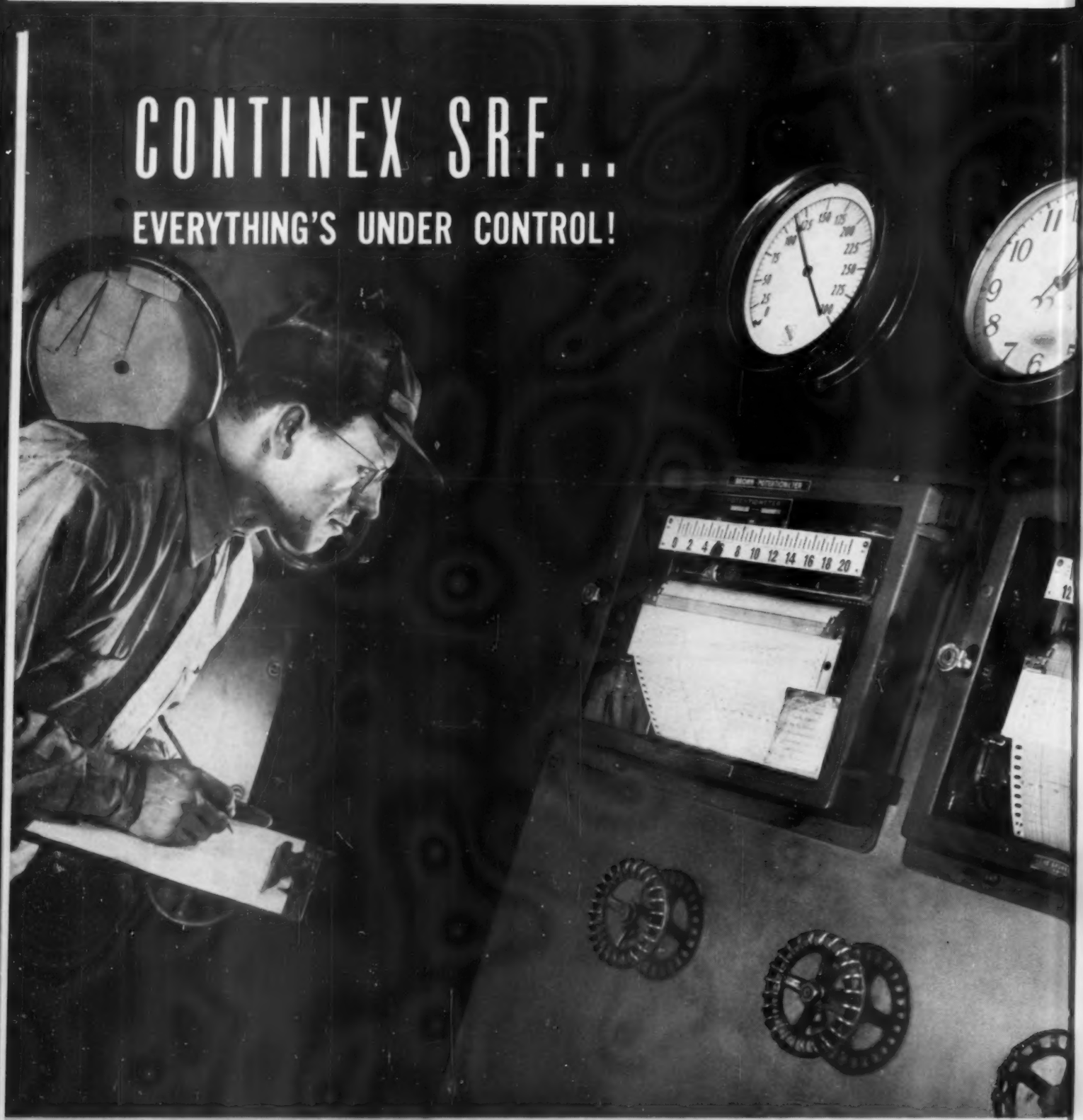

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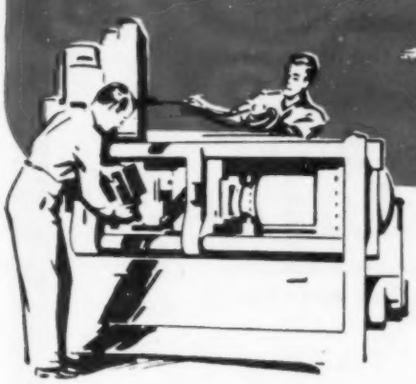

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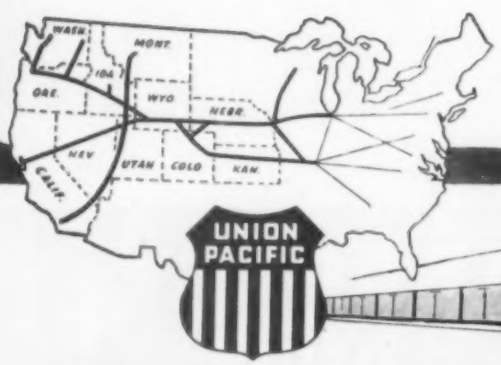

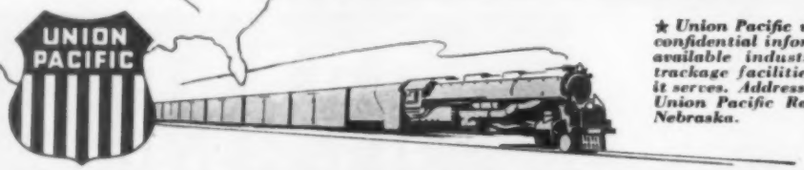

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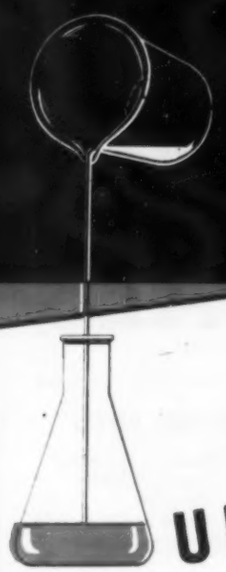

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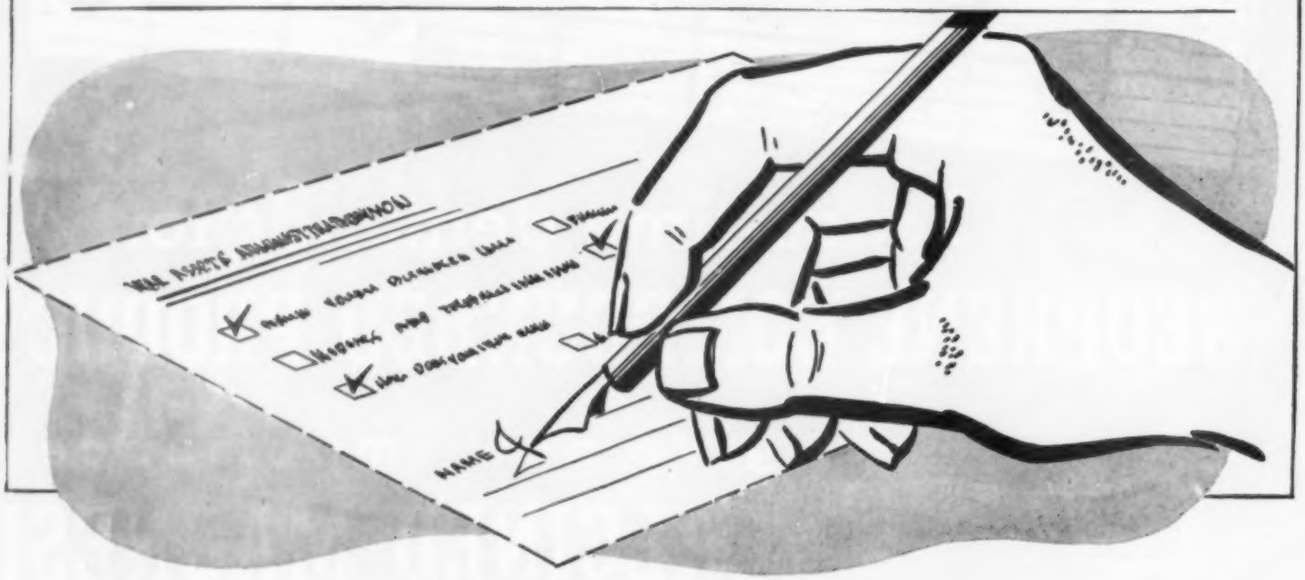

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Cleveland, Ohio

Technical Bulletin No. 26 — on the Compounding of GR-S with Substantial Loadings of Zinc Oxide

Further Studies with Superaging GR-S Compounds

ORIGINAL RESULTS

Time of Cure Min. at 310° F.	Tensile Strength (psi)	Per Cent Elongation	Modulus—Load (psi) for Elongation of:				Permanent Set	Shore Hardness
			200%	300%	400%	500%		
2	1925	830	150	225	340	450	.75	46
4	1920	725	195	275	390	590	.59	48
7.5	1940	675	215	310	465	700	.50	49
15	1920	600	240	360	560	840	.41	50
30	1900	590	270	390	580	890	.35	52
45	1640	575	265	380	610	950	.32	52
60	1485	555	265	380	570	990	.28	51
90	1425	550	240	355	555	950	.27	51

AFTER 20-HOUR AIR PRESSURE HEAT TEST*

Time of Cure Min. at 310° F.	Tensile Strength (psi)	Per Cent Elongation	Modulus—Load (psi) for Elongation of:					Permanent Set
			100%	200%	300%	400%	500%	
2	1310	470	425	540	690	960	...	.42
4	1360	495	440	560	680	950	...	.45
7.5	1310	480	435	595	750	910	...	.46
15	1400	495	440	600	760	1000	...	.51
30	1335	480	470	625	785	1020	...	.45
45	1370	485	470	625	745	1020	...	.45
60	1280	480	465	620	775	1010	...	.42
90	1320	495	520	680	800	1040	...	.44

* Test Conditions: 260° F., 80 lb. Air Pressure.

A PREVIOUS Technical Bulletin (No. 21) featured a sulfurless compound satisfying the requirements of A.S.T.M. Standard Specification D754-43T after aging 20 hours in the Air Pressure Heat Test at 126° C. and 80 lbs. air pressure.

The study is continued and higher tensiles are realized with a lower cost compound than with that previously reported. Aged tensiles exhibit the desirable plateau effect and aged elongation is well preserved over the entire curing range—in fact, there are indications of a tendency toward reversion. This compound also meets A.S.T.M. Standard Specification D754-43T.

COMPOUND NO. 26

GR-S	100.0
Sulfur	1.5
Zenite	1.75
Thionex	0.5
DPG	0.5
Sublimed Litharge	5.0
Coumarone-indene Resin	15.0
Mineral Rubber	10.0
Akroflex C	2.0
Heliozone	4.0
Stearic Acid	1.0
Calcene	75.0
Suprex Clay	25.0
Zinc Oxide	50.0

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BASE COMPOUNDS	A	B	C
Smoked Sheets	100		
GR-S		100	
Reclaim M-60			200
Gastex	25	25	10
Thermax	25	25	15
EPC Black	35	35	
ZnO	5	5	5
Stearic Acid	1	1	1
Sulfur	3	2	2
Benzothiazyl Disulfide	1	1.5	1
DPG		0.25	
INDONEX 639½	20	20	10
BLE	1	1	1
	216	215.75	245

Compounds A-B-C were blended to give the additional compounds shown below

RUBBER HYDROCARBON PROPORTIONS

	A	F	G	B	D	E	H	I	C
Smoked Sheets	100	50	25		50	25			
GR-S		50	75	100	25	50	50	25	
Reclaim					25	25	50	75	100

Original Tests—Average of 8 Cures at 316°

Modulus 200%	731	1106	1091	1082	903	922	632	449	472
Tensile	1922	2103	1938	1579	1888	1775	1344	976	638
% Elongation	466	410	387	375	438	407	450	445	373
Hardness	59	64	65	64	63	65	59	51	38
Tear	382	352	277	280	302	313	247	162	117

Oven Aged 70 Hrs. at 212°F. Average of 8 Cures

Modulus 200%	1460						1033	831	625
Tensile	1685	1792	1765	1731	1525	1566	1325	1118	717
% Elongation	250	187	185	176	213	209	265	284	240
Hardness	74	76	77	77	73	74	66	61	52
Tear	226	204	208	184	205	199	186	164	123

Compression Set 30% Deflection ASTM Method B

22 Hrs. 158°F.	32.4	21.4	20.5	23.8	26.8	24.6	35.6	39.8	41.6

For further information send for bulletin 13 & 13A

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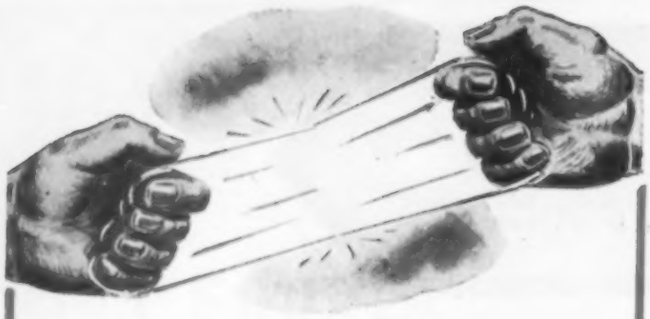

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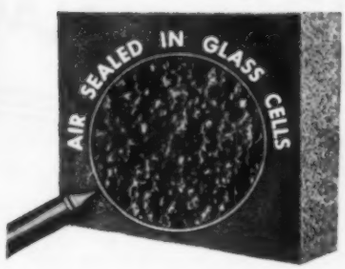
PC Foamglas licks tough insulating problems on roofs, in walls and floors. The big, oblong blocks are light in weight, easy to handle, but still rigid, strong and durable. PC Foamglas stays where it is laid. It does not creep, slip, pack down or powder.

In all sorts of plants all over the country, wherever conditions are really tough, PC Foamglas does an efficient job. It helps to maintain temperature levels, to minimize condensation.

Here you see PC Foamglas being laid in hot pitch over a layer of roofing felt. Later the specified built-up roofing will be applied and finished with a gravel surface. The PC Foamglas cant strips can be seen along the parapet wall at the right.
Architect: E. Brielmaier & Sons Co., 735 N. Water St., Milwaukee, Wis.



Makeshift wooden cant strips have long been a source of roofing trouble. Now you can get cant strips made of PC Foamglas. You need not fear that they will check, swell, shrink or rot.

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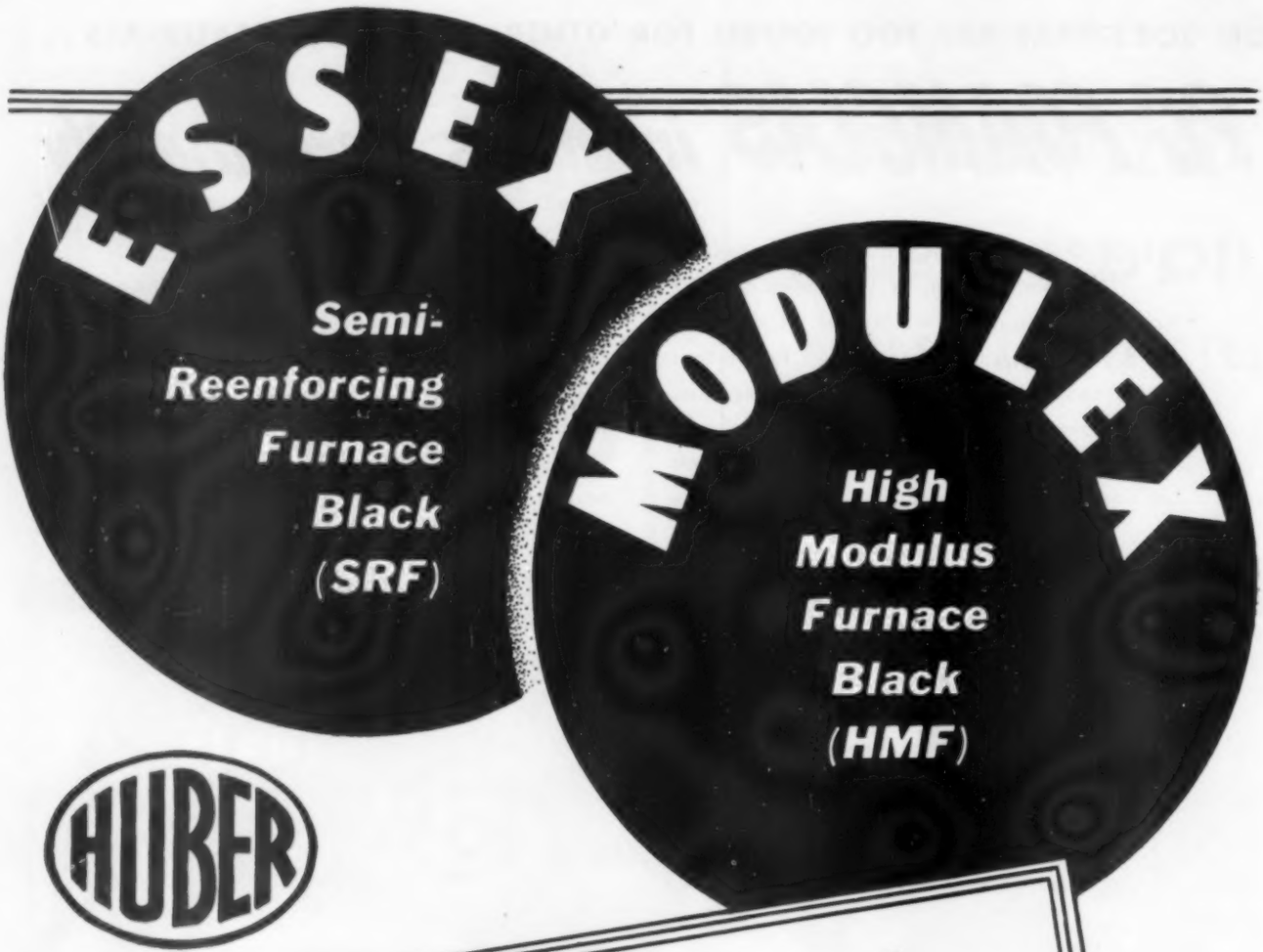

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The RUBBER AGE

VOLUME 60

NUMBER 1

One of the World's Outstanding Rubber Journals

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RUBBER AGE

VOL. 60, No. 1 OCTOBER, 1946

Swelling of Rubber

III—The Swelling Behaviour of Vulcanized Natural Rubber and GR-S in Mixtures of Hydrocarbons

BY FRITZ S. ROSTLER AND KATHLEEN S. ROSTLER

Engineering Experiment Station, University of Delaware, Newark, Delaware

AN investigation made in this laboratory on the swelling behaviour of vulcanized GR-S and smoked sheets in a number of organic liquids has been reported previously *(1)*. Certain generalizations were made as to the relation of degree of swelling of each of the rubbers to the chemical nature of the liquid. With hydrocarbons it was found that the swelling behaviour could be related to the refractive index of the liquid, if the refractive index was expressed in terms of the difference between the refractive index of the hydrocarbon in question and that of the corresponding straight chain paraffin, i.e., having the same number of carbon atoms. This value, which was designated as Δn_D, can be considered as a better measure of structure than the refractive index, since it eliminates the factor of molecular weight.

The purpose of the present investigation was to find out whether the relationship found in the previous study on single hydrocarbons could be applied to mixtures of hydrocarbons, and to study in detail the swelling behaviour of the two rubbers, GR-S and smoked sheets, in hydrocarbon oils of higher molecular weight from petroleum.

Some oils of this type have also been examined in this laboratory and the results published earlier *(2)*. Special consideration was given to the usefulness of these products for reclaiming purposes. The knowledge of the swelling behaviour of petroleum oils of higher molecular weight is, however, of importance not only for the reclaimer, but also for the rubber compounder, since in this broad group of higher molecular weight products fall all the plasticizers, extenders, process oils, lubricants and anti-sunchecking agents of petroleum origin. The swelling behaviour of a rubber in an oil is at least an indication of their compatibility. It has been pointed out by Ludwig, Sarbach, Garvey and Juve, for instance, that swelling (solvent action) is a valuable guide in the selection of softeners *(3)*.

The earlier investigation reported from this laboratory on this type of oils, which dealt with a large number of swelling liquids, was necessarily confined to comparing the oils at a few fixed swelling times and temperatures. It became apparent, however, on further investigation of a few of the oils that data collected under arbitrarily selected test conditions are not sufficiently indicative for behaviour under other conditions with oils of higher molecular weight where viscosity-temperature relationships are of tremendous influence. The aim of the present investigation was consequently not only to check the validity of relationships previously found between chemical nature and swelling effect, but also to determine the behaviour of the rubbers in a few oils under widely varied conditions of time and temperature. It was expected that a thorough investigation of a few typical swelling liquids from this group of petroleum products would reveal common characteristics and differences in behaviour of different types of oils.

TABLE I—Δn_D AND SWELLING EFFECT OF LIQUIDS OF KNOWN COMPOSITION.

Liquid Number	Composition of Liquid Percent by Weight	% Swelling 24 hrs. at 25°C GR-S	% Swelling 24 hrs. at 25°C Smoked Sheets	Average Number Carbon Atoms	n_D^{25} Straight Chain Paraffin	n_D^{25} Measured	Δn_D^{25}
1	100% n-Heptane	95	140	7	1.386	1.386	0.000
2*	100% Diisobutylene	125	160	8	1.396	1.408	0.012
3	100% Methylcyclohexane	220	195	7	1.386	1.422	0.036
4	100% Benzene	290	200	6	1.373	1.500	0.127
5	100% Toluene	300	220	7	1.386	1.496	0.110
6	100% Xylene	315	235	8	1.396	1.495	0.099
7	90% n-Heptane 10% Diisobutylene	105	140	7.5	1.391	1.396	0.005
8	90% n-Heptane 10% Methylcyclohexane	145	165	7	1.386	1.401	0.015
9	90% n-Heptane 10% Benzene	210	200	6.5	1.379	1.429	0.050
10	90% Diisobutylene 10% Methylcyclohexane	165	185	7.5	1.391	1.414	0.023
11	90% Methylcyclohexane 10% Benzene	280	245	6.5	1.379	1.454	0.075
12	33.3% n-Heptane 33.3% Diisobutylene 33.3% Benzene	195	195	7	1.386	1.422	0.036
13	33.3% n-Heptane 33.3% Methylcyclohexane 33.3% Benzene	220	215	6.7	1.381	1.427	0.046
14	12.5% Benzene 50.0% Toluene 37.5% Xylene	315	245	7.25	1.388	1.495	0.107
15**	55.2% Diisobutylene 44.5% Liquid No. 14	235	205	7.7	1.393	1.442	0.049

* A.S.T.M. Designation: D 471 - 44T, Reference Fuel No. 1
** A.S.T.M. Designation: D 471 - 44T, Reference Fuel No. 2

Experimental Procedure

The two test compounds used were the same ones used in the previous investigations mentioned *(1, 2)*. The formulas in parts by weight are given below:

GR-S	100.00	0.00
Smoked sheets	0.00	100.00
Stearic acid	1.00	1.00
Sulfur	2.00	2.00
Pine tar	5.00	5.00
MPC black	45.00	45.00
Zinc oxide	5.00	5.00
Benzothiazyl disulfide	1.50	1.50
Diphenylguanidine	0.25	0.25

Both compounds were cured for 50 minutes at 45 pounds.

Rubber samples used for swelling tests were cut from A.S.T.M. tensile slabs* and had approximate dimensions of 4.5 x 2 x 0.2 cm. The samples were immersed in approximately 120 cc. of the liquids under investigation in test tubes of 35 mm. inside diameter. For tests at elevated temperatures (60°, 120°, 175°C.) the tubes were placed in a constant temperature bath having a temperature fluctuation not greater than ±1°C.

Where time-swelling relationships were being tested involving frequent measurements (at intervals shorter than 8 hours) several samples were immersed in the liquid, and one removed for measurement at each time interval. Where the interval was longer than 8 hours it was assumed that no appreciable error was introduced by returning the samples to the liquid immediately after measurement for further swelling.

Measurements of volume of the rubber samples before and after swelling were made by placing the sample in a tube of dilute sodium oleate solution equipped with an inclined calibrated side arm. Volume of the sample was read by displacement of the solution into the side arm. This device has previously been described in detail *(2)*. After removing from the test liquids, test specimens were washed by dipping in petroleum ether and then in alcohol before immersing in the measuring device, in order to remove surface oil and assure wetting of the sample. Before returning to the swelling liquid, the washing process was reversed.

All swelling measurements were made in duplicate and the results averaged. Where duplicate tests did not check within 10%, measurements were repeated.

The swelling liquids investigated are identified by boiling range, viscosity at two temperatures, mixed aniline point, refractive index, specific gravity and average molecular weight. Boiling range was determined by distillation at a pressure of 10 mm. Hg into a graduated receiver. Viscosity was measured at 25°C. and 60°C. with a Hoeppler falling ball viscosimeter. The mixed aniline point reported is the aniline point of a 1:1 mixture by volume of the oil with pure *n*-heptane (aniline point 69.7°C.). This value was measured since the straight aniline point of the four unsaturated oils is too low to be measured. Refractive index was measured with an Abbe refractometer. Specific gravity was measured with a set of hydrometers accurate to at least five in the third decimal place. Average molecular weight was determined by the elevation of the boiling point of benzene in a Beckman apparatus.

Refractive Index and Swelling in Mixtures of Known Composition

Mixtures were made up with various combinations of a paraffinic hydrocarbon (*n*-heptane), an olefin (diisobutylene), a cycloparaffin (methylcyclohexane), and aromatic hydrocarbons (benzene, toluene and xylene). Measurements were made of the swelling of GR-S and smoked sheets samples immersed for 24 hours at room temperature (25°C.) in the mixtures and in their components. As shown previously *(1)* these conditions of time and temperature give swelling figures very close

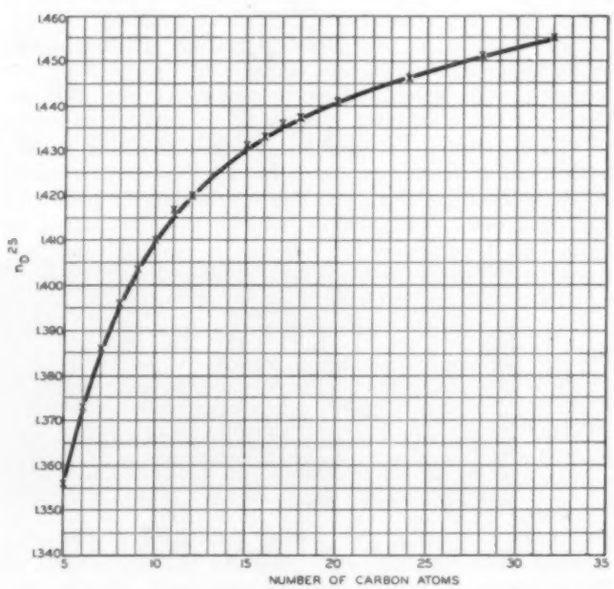


FIG. 1—Refractive Index of Straight Chain Paraffins.

* Cured according to A.S.T.M. Designation D 15-41.

TABLE II—PHYSICAL PROPERTIES OF SWELLING LIQUIDS.

Designation of Swelling Liquid	Boiling Range at 10 mm. Hg			Viscosity in Centipoises		Mixed Aniline Point	n_D^{25}	Specific Gravity		Average Molecular Wt.	Trade Name and Source
	Initial	50%	End	25°C.	60°C.			25/25	60/25		
Solid paraffin*	220	245	280	-	4.92[X]	93.2°C.	1.450[Δ]	-	0.770	330	"Essowax", Esso, Inc.
White oil 1	165	215	285	23.0	6.6	83.5°C.	1.467	0.860	0.815	340	"Atlantic Stabilized 85 White Oil", Atlantic Refining Co.
White oil 2	180	230	265	135.	20.5	84.8°C.	1.482	0.890	0.850	360	"Squibb Mineral Oil", E. R. Squibb and Sons
Process oil	145	220	300	62.4	11.0	63.7°C.	1.506	0.920	0.895	290	"Circo Light Process Oil", Sun Oil Co.
Unsaturated oil 1	90	195	245	26.7	5.7	27.0°C.	1.550	0.980	0.950	260	"Wilcor Reclaiming Oil 111", Wilmington Chemical Corp.
Unsaturated oil 2	150	210	250	75.	11.0	32.3°C.	1.557	0.990	0.950	260	Prepared in our laboratory
Unsaturated oil 3	150	235	275	230.	20.9	31.7°C.	1.564	1.000	0.960	270	from naphthenic base crude oil.
Unsaturated oil 4	250	295	330	15000.	217.	29.0°C.	1.585	1.020	0.990	350	

*Melting point 54°C.

[X]Viscosity at 85°C. = 3.06 centipoises

[Δ]Calculated from 1.4360 at 61°C.

to the swelling maximum as defined by Scott *(4)* with liquids of this molecular weight range.

The composition of the mixtures and the swelling data are reported in Table I. The swelling figures for the mixtures are between those of the components, but are not in all cases a true average. This behaviour is in general in agreement with findings reported by other investigators of the swelling of rubber in mixtures of liquids *(5, 6)*.

In order to determine whether the swelling of the two rubbers in the mixtures bore the same relation to their refractive index as was the case with single hydrocarbons, Δn_D was calculated for the mixtures from the measured refractive index. The mixtures tested have, in many cases, an average number of carbon atoms between whole numbers, such as 6.5, 7.7, etc. The figure correctly to be subtracted in calculating Δn_D is therefore the refractive index of a mixture of paraffins having the same average number of carbon atoms as the mixture under investigation.

The curve in Figure 1 was constructed in order to be able to estimate the refractive index of straight chain paraffin mixtures having average numbers of carbon atoms between whole numbers. This curve also makes it possible to estimate the value for higher molecular weight paraffins for which no accurate measurement is to be found in the literature. The values for refractive index used to plot this curve were taken from Egloff's *(7) Physical Properties of Pure Hydrocarbons* *. Values for refractive index of straight chain paraffins given in Table I are read from this curve, and the Δn_D for the liquids are calculated with these values.

* The values in the tables of this book are given for the most part at temperatures other than 25° C. A correction of 0.0004 per degree was therefore used to correct the values to the refractive index at 25° C. The use of this uniform correction gives values sufficiently accurate for the purpose.

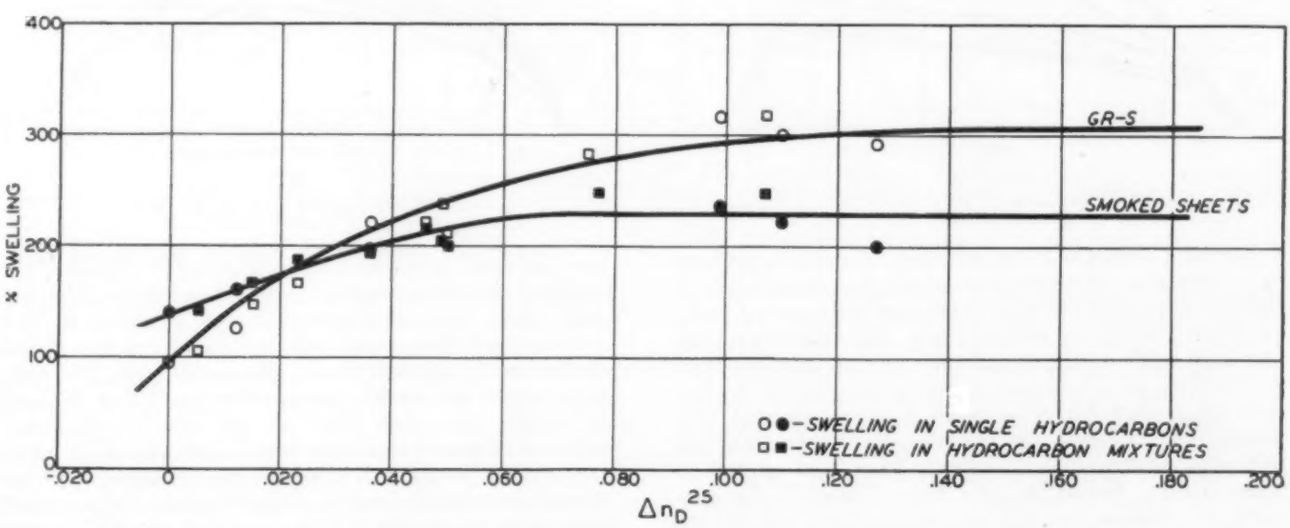
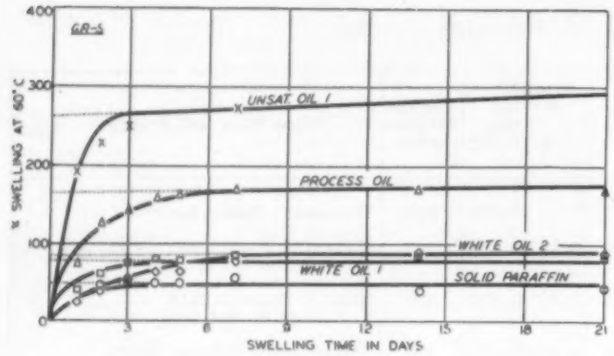
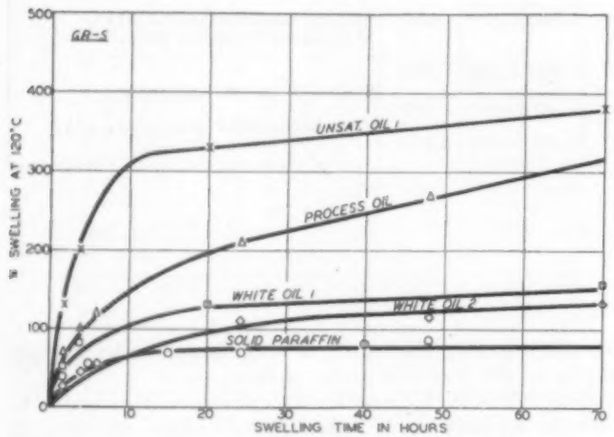


FIG. 2—Relation of Swelling in Low Molecular Weight Hydrocarbon Mixtures to Curve for Pure Hydrocarbons.





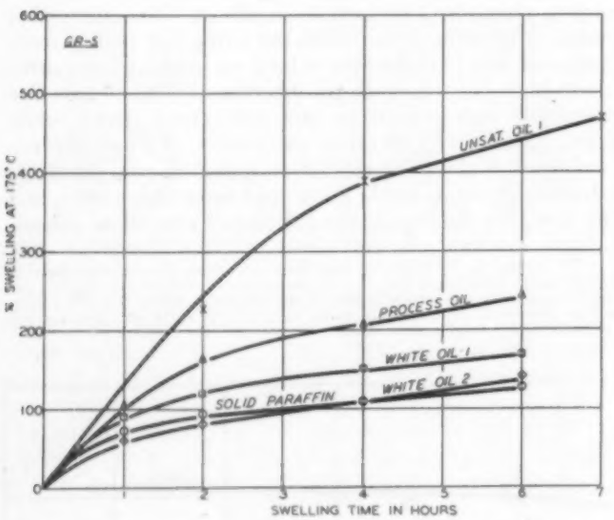
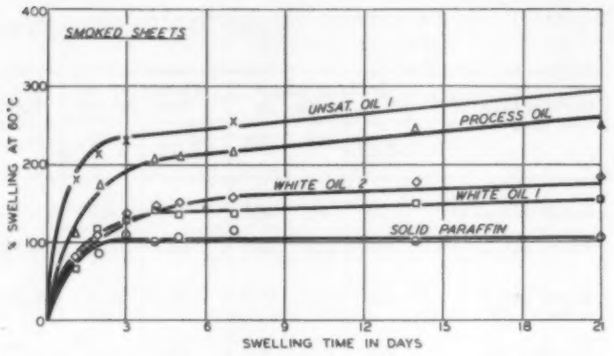
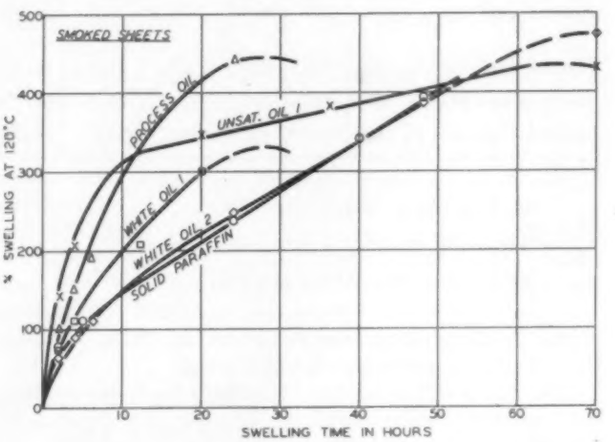


FIG. 3—Swelling of GR-S in Various Types of Petroleum Oils.





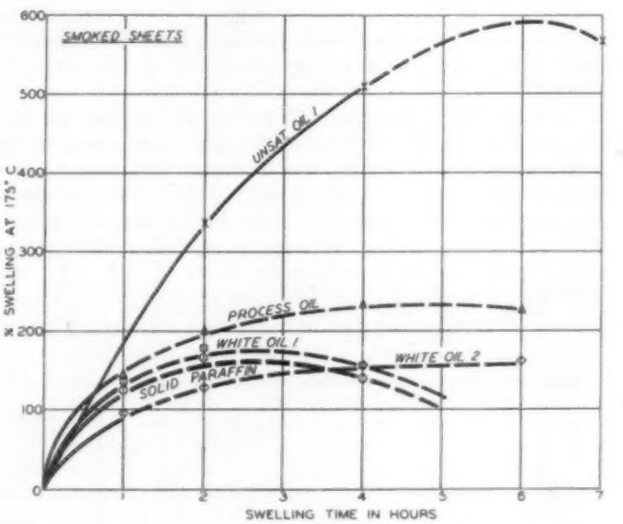
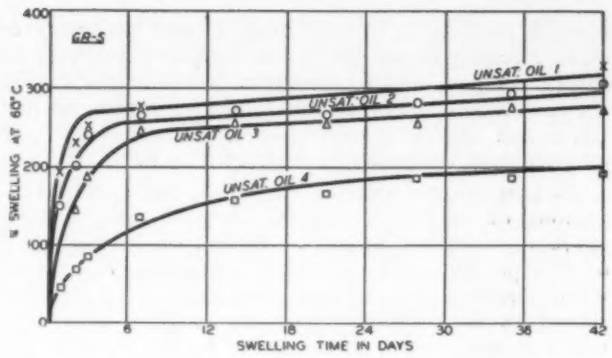
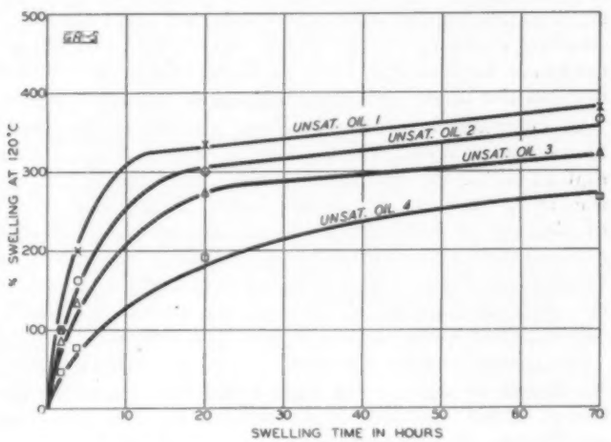


FIG. 4—Swelling of Smoked Sheets in Various Types of Petroleum Oils.

Figure 2 shows that the swelling of the two rubbers in mixtures of hydrocarbons bears the same relationship to refractive index as is the case with pure hydrocarbons. The curves in this figure are taken from the previous study *(1)* and had been drawn from the data for swelling of GR-S and smoked sheets in pure hydrocarbons against the Δn_D of the swelling iquids. The points from Table I for the pure liquids and for the mixtures measured in this study have been plotted on these curves. As can be seen from Figure 2, the mixtures as well as the hydrocarbons themselves fit the previously established curve. These curves can therefore be used to predict with reasonable accuracy the swelling of the two rubber compounds in hydrocarbon mixtures as well as in pure hydrocarbons.

It has to be borne in mind that all data reported, and consequently, also the curves for swelling against Δn_D, refer to the two rubber compounds containing 45 parts by weight of carbon black on 100 rubber. Since in a rubber compound only the rubber hydrocarbons swell, the percent swelling is in proportion to the rubber hydrocarbon content and readings from the curves will have to be converted if they are to be applied to other volume loadings of filler.





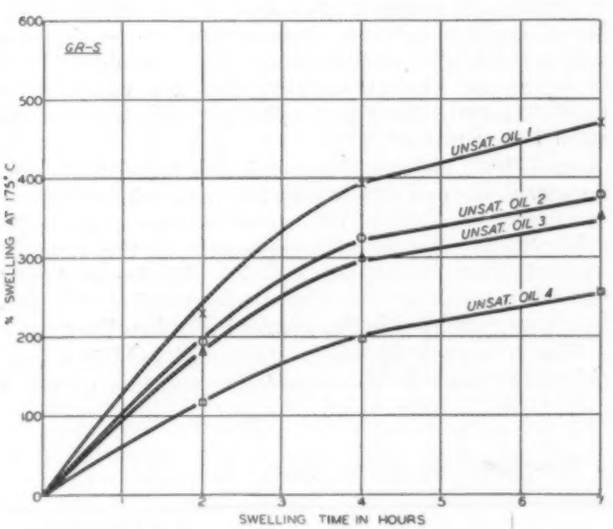
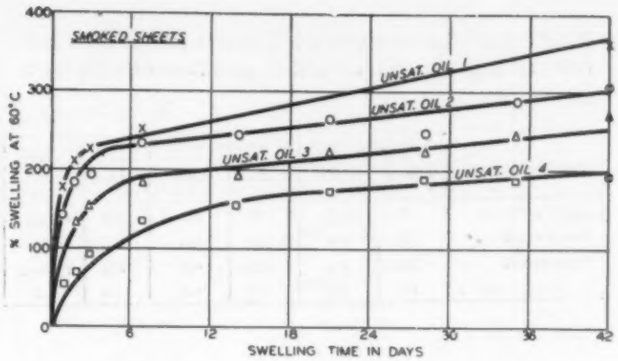
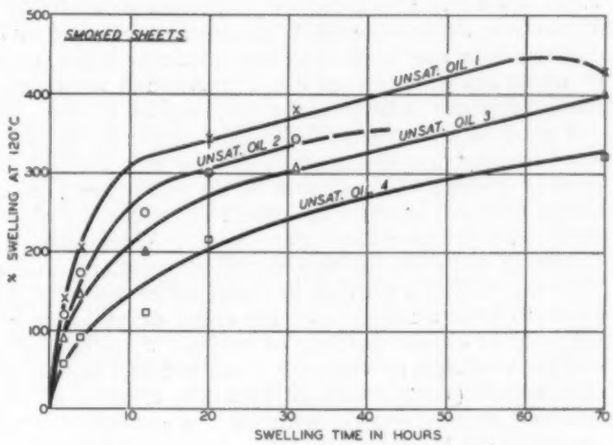


FIG. 5—Swelling of GR-S in Unsaturated Petroleum Oils of Various Viscosities.





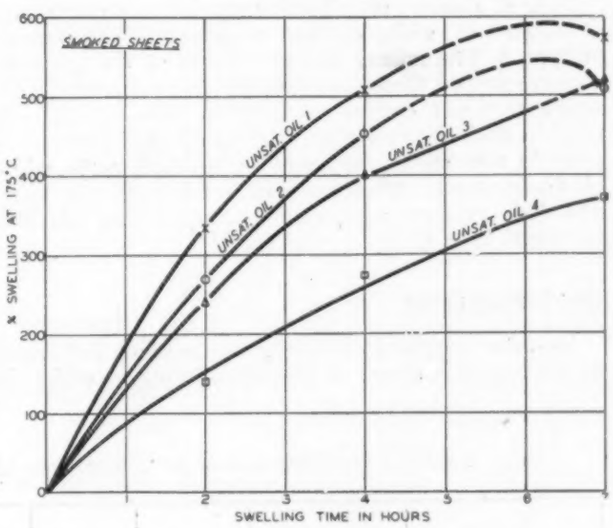


FIG. 6—Swelling of Smoked Sheets in Unsaturated Petroleum Oils of Various Viscosities.

Types of Petroleum Products Investigated

Eight petroleum hydrocarbon products were selected for the study of the swelling behaviour of vulcanized GR-S and smoked sheets in higher molecular weight, viscous hydrocarbon oils. The swelling liquids tested, their physical properties and source are given in Table II.

Swelling liquids used in this study were selected to be representative of four general types. All higher molecular weight petroleum hydrocarbon compositions, except asphalts, likely to be encountered in connection with rubber belong to one of these types, which are as follows:

Type 1. Solid paraffin. Solid paraffins consist essentially of straight chain paraffinic hydrocarbons not reactive with fuming sulfuric acid at room temperature.

Type 2. White oil. This group of oils is also characterized by being unreactive with fuming sulfuric acid, but white oils are, in distinction to solid paraffins, liquid at room temperature. Chemically they are assumed to consist principally of branched chain paraffins and cycloparaffins. Two representatives of this group, designated as "white oil 1" and "white oil 2", were tested.

TABLE III—INFLUENCE OF TEMPERATURE ON COMPARATIVE SWELLING OF GR-S AND SMOKED SHEETS.

Swelling Liquid	% Swelling after 7 days at 60°C.		% Swelling after 20 hrs. at 120°C.		% Swelling after 4 hrs. at 175°C.	
	GR-S	Smoked Sheets	GR-S	Smoked Sheets	GR-S	Smoked Sheets
Solid paraffin	50	105	75	210	110	Sample
White oil 1	75	140	130	300	155	disinte-
Process oil	170	220	195	415	215	grating
Unsaturated oil 1	270	250	330	340	390	510

White oil 2 contains a higher proportion of cyclic hydrocarbons than white oil 1, as can be seen from the differences in specific gravity and refractive index, both of which are greater than can be accounted for by the small difference in their molecular weights.

Type 3. Unsaturated oils, consisting of the unsaturated hydrocarbon components of their respective fractions of crude petroleum, that is, the constituents other than white oil and solid paraffin. Four oils were tested from this group which were similar chemically, as shown by the data for mixed aniline point, refractive index and specific gravity, but differed in viscosity. In order to have a measure of the effect of variation of viscosity of oils on swelling of rubbers, these oils were chosen to range in viscosity from a low viscous reclaiming oil (unsaturated oil 1) to the viscosity of the commercial unsaturated hydrocarbon extenders (unsaturated oil 4).

Type 4. Process oils. These materials are chemically a mixture of white oil and unsaturated components of type 3. The nature and proportion of the chemical constituents of these oils depends on the crude from which they are derived and on the refining methods used in their manufacture. The particular process oil used in this study contained by analysis 60% white oil (components unreactive with fuming sulfuric acid) and 40% reactive components. Lubricating oils also belong to type 4.

Time-Swelling Curves

In order to gain a picture of the swelling behaviour of rubbers in a group of liquids differing as widely in rate of swelling as those tested, it was necessary to make swelling measurements at frequent intervals on rubber samples, and to construct time-swelling curves for the behaviour in each oil. Time-swelling curves for GR-S and smoked sheets in each of the oils at three temperatures are given in Figures 3 to 6.

As first pointed out by Scott *(4)*, the swelling behaviour of rubber in liquids, and the time-swelling curve representing it, can be looked on as the result of two phenomena occurring simultaneously—a rapid initial swelling to a swelling maximum, and a constant slower swelling, designated as the swelling increment, which is represented in the curve by the slope of the later straight portion. The value for the swelling maximum as defined by Scott can be obtained from the time-swelling curve by extrapolating the straight portion of the curve back to zero time, as illustrated by the dotted lines in the upper graph of Figure 3.

A comparison of the swelling curves at the three temperatures tested, 60°C., 120°C., and 175°C., shows that at 60°C. the swelling maximum of the rubber in the oil is the most important factor in the total effect of the oil on the rubber. Especially with GR-S, the phenomenon represented by the swelling increment is relatively unimportant at this temperature. In the white oils and paraffin, GR-S showed no measurable swelling increment over a period of three weeks.

At a temperature of 120°C., however, the swelling increment becomes of at least equal importance to the initial rapid swelling represented by the swelling maximum. At this temperature the swelling increment is particularly important in a comparison of the swelling of the two rubbers. Since smoked sheets shows a very much higher swelling increment than does GR-S in all except the unsaturated oils, the comparative swelling picture changes completely at this temperature from the picture at 60°C.

At 175°C. the swelling maximum is relatively unimportant in comparison with the tremendous swelling increment. With all the oils except the unsaturated oils, this phenomenon is so pronounced in the case of smoked sheets, that the samples disintegrated and started to break up and disperse in the oil within two hours, as expressed in the graphs by broken lines.

The time-swelling curves presented exhibit a considerable change in the comparative swelling of GR-S

TABLE IV—COMPARISON OF SWELLING MAXIMA MEASURED AND READ FROM FIGURE 2.

Swelling Liquid	Swelling Maximum at 60°C.		Average Molecular Weight	Ratio Carbon: Hydrogen	Average Number Carbon Atoms	n_D^{25} Measured	n_D^{25} Straight Chain Paraffin	Δn_D^{25}	% Swelling read from Figure 2		% Deviation of Measured Swelling Maximum from Swelling Read from Curves	
	GR-S	Smoked Sheets							GR-S	Smoked Sheets	GR-S	Smoked Sheets
Solid paraffin	50	105	330	1:2	24	1.450	1.446	0.004	115	145	56%	27%
White oil 1	80	130	340	1:2	24	1.467	1.446	0.021	175	175	54%	26%
White oil 2	85	155	360	1:2	26	1.482	1.449	0.033	205	195	59%	21%
Process oil	165	195	290	1:1.7	21	1.506	1.442	0.064	260	225	37%	13%
Unsaturated oil 1	260	220	260	1:1.3	20	1.550	1.441	0.109	295	230	12%	4%
Unsaturated oil 2	255	220	260	1:1.3	20	1.557	1.441	0.116	300	230	15%	-4%
Unsaturated oil 3	240	185	270	1:1.3	20	1.564	1.441	0.123	300	230	20%	20%
Unsaturated oil 4	175	155	330	1:1.3	25	1.585	1.448	0.137	305	230	43%	33%

and natural rubber from one temperature to another, caused by the preponderance of incremental swelling at higher temperatures. This effect is shown numerically in Table III. In this table are given for comparison the figures for percent swelling of GR-S and smoked sheets in one representative swelling liquid of each of the oil types after 7 days at 60°C., after 20 hours at 120°C., and after 4 hours at 175°C. As can be seen from this data, the swelling of the two rubbers in unsaturated oils remains very much alike, regardless of temperature. In oils composed completely or largely of saturated hydrocarbons the difference between the swelling values of the two rubbers increases considerably with temperature. At 175°C. a length of time which serves to give only moderate swelling with GR-S causes the smoked sheets specimen to disintegrate and disperse.

Relation of Swelling to Refractive Index

The swelling curves in Figures 3 to 6 give a general picture of the behaviour of vulcanized GR-S and smoked sheets immersed in an excess of oils of higher molecular weight of the various types tested. The frequent swelling measurements required for the construction of a time-swelling curve consume too much time to be a practical procedure where any number of oils are to be evaluated. An attempt was therefore made to establish a relationship between the swelling behaviour of the oils and a property of the oil, which would allow prediction of swelling behaviour without laborious measurement.

It can be expected that the swelling maximum of the rubber in an oil of higher molecular weight will be dependent on the refractive index of the liquid in the same way as was the case with low molecular weight hydrocarbons and hydrocarbon mixtures. In order to ascertain whether the same relationship applies, the swelling maxima measured on the two rubbers in the oils were compared with the swelling value which would be expected from the relation of swelling to Δn_D expressed by the curves shown in Figure 2.

This comparison is shown in Table IV. In the first column are given the designations of the swelling liquids. In the next two columns are listed the swelling maxima for GR-S and smoked sheets in each oil, obtained from the swelling curves at 60°C. by extrapolating the straight portion of the curve to zero time, as explained earlier. (The values for swelling at 60°C. were used for this comparison, since the curves for the higher temperatures were made from fewer measurements, and consequently do not allow accurate extrapolation.) In the fourth column are listed the average molecular weights of the swelling liquids, and in the fifth column, the carbon:hydrogen ratios. The average number of carbon atoms given in the sixth column was calculated from these two figures. In column 7 is given the measured refractive index, and in column 8, the refractive index of the corresponding straight chain paraffin, read from Figure 1. The difference between the two values, designated as Δn_D, is listed for each oil in column 9. Columns 10 and 11 give the swelling of GR-S and smoked sheets to be expected from the value for Δn_D, read from the curves in Figure 2. These theoretical values are in most cases considerably higher than the measured swelling maxima.

* $\frac{\text{(Expected swelling minus measured swelling maximum)} \times 100}{\text{Expected swelling}} =$ % deviation

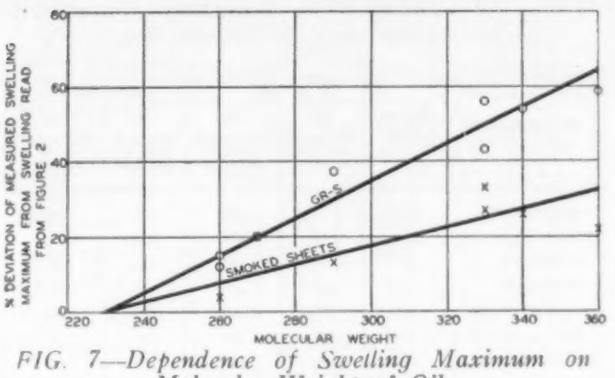


FIG. 7—Dependence of Swelling Maximum on Molecular Weight of Oil.

The percentage* by which the measured values deviate from the expected swelling are listed in the last two columns of Table IV.

Since the only essential characteristic in which these oils differ from the hydrocarbon mixtures tested in the first part of the investigation is their molecular weight, it must be assumed that the higher molecular weight is responsible for the fact that the same curve cannot be used to predict their swelling effect from refractive index. The relationship between deviation from the curve and molecular weight is shown graphically in Figure 7, where the percent deviation of the swelling maxima of the two rubbers in the oils from the expected values (figures in the last two columns of Table IV) is plotted against molecular weight of the oil. The graph shows that this deviation of measured swelling from expected swelling is proportional to the amount the molecular weight of the oil exceeds a limiting value of 230, below which the molecular weight of the oil does not appear to affect the swelling maximum. The relationship shown graphically by Figure 7 is expressed mathematically by the equations given below:

For GR-S: $$S_m = S_{th}[1-0.005(M-230)] \quad (I)$$

or, conversely: $$S_{th} = \frac{S_m}{1-0.005(M-230)} \quad (II)$$

For smoked sheets: $$S_m = S_{th}[1-0.0025(M-230)] \quad (III)$$

or, conversely: $$S_{th} = \frac{S_m}{1-0.0025(M-230)} \quad (IV)$$

Where S_m = the measured swelling maximum of the rubber in the oil,

S_{th} = the swelling figure for the rubber to be expected from the Δn_D of the oil (as read from Figure 2),

M = the average molecular weight of the oil.

In order to test the accuracy of these formulas, the theoretical swelling was calculated from the measured swelling maximum for each oil and rubber and the values thus obtained plotted in Figure 8 along the curves from Figure 2. The values used in plotting the points are given in Table V. As can be seen from

TABLE V—THEORETICAL SWELLING MAXIMUM CALCULATED FROM MEASURED VALUE.

Swelling Liquid	Average Molecular Weight	GR-S		Smoked Sheets	
		S_m (Measured Swelling Maximum)	S_{th} (Calculated from Equation II)	S_m (Measured Swelling Maximum)	S_{th} (Calculated from Equation IV)
Solid paraffin	330	90	100	105	140
White oil 1	340	80	180	130	180
White oil 2	360	85	240	155	230
Process oil	290	165	240	195	230
Unsaturated oil 1	260	260	310	220	240
Unsaturated oil 2	260	255	300	220	240
Unsaturated oil 3	270	240	300	185	210
Unsaturated oil 4	330	175	350	155	210

Figure 8, the swelling values corrected in this manner fit the curve, showing that the formulas are reasonably exact.

The correction formulas given above were, as pointed out, calculated on the basis of the figures for swelling maximum at 60°C. If swelling maxima are read by extrapolation from the curves for swelling of GR-S at 120°C. in Figures 3 and 5, they are slightly higher in each case than those at 60°C. However, the differences are small enough, so that the inaccuracy involved in using the formulas at temperatures other than that on which they are based experimentally should not involve more than a tolerable error in the estimated figure.

The use of these empirically determined equations makes it possible to predict the swelling maximum of GR-S and smoked sheets in a heavy oil, as well as in low molecular weight hydrocarbons from properties of the oil easily measured in any laboratory. In order to use the formulas three characteristics need to be known:

Refractive index,

Average molecular weight, and

Average number of carbon atoms, in order to calculate Δn_D.

The refractive index is easily measured in any laboratory. Average number of carbon atoms can be calculated from average moelcular weight and carbon: hydrogen ratio. Molecular weights and carbon:hydrogen ratio of the swelling liquids used in this investigation were known by analysis. Both molecular weight and carbon:hydrogen ratio can, however, be conveniently estimated by means of charts from specific gravity and either average boiling point or viscosity, all properties easily determined. Charts of this type reproduced from the original literature can, for instance, be found in *The Science of Petroleum (8)*. With the oils used in this study, estimates of molecular weight and carbon:hydrogen ratio made in this manner agree quite accurately with the measured values.

As can be seen from the time-swelling curves in Figures 3 to 6, the value for swelling maximum is a very good measure of the ultimate swelling behaviour of either rubber at a temperature of 60°C. With GR-S, even at 120°C. a rough approximation of the swelling behaviour is offered by the swelling maximum. At higher temperatures, especially with smoked sheets, a knowledge of the swelling maximum is not sufficient to predict swelling behaviour, since, at elevated temperatures, as pointed out before, the swelling increment (represented by the slope of the latter portion of the swelling curve) becomes the important factor in the total swelling.

Relation of Swelling Increment to Chemical Nature of the Oil

It is obvious that means to relate the swelling increment, the second factor in the time-swelling curve, to some measurable property of the oil would be of considerable assistance in predicting the total swelling effect of an oil from its characteristics. Unfortunately, no such relationship has as yet been found. However, certain generalizations can be made on the basis of the figures for swelling increment (percent swelling in 100 hours on the straight portion of the swelling curve) listed in Table VI and from the curves in Figures 3 to 6, as follows:

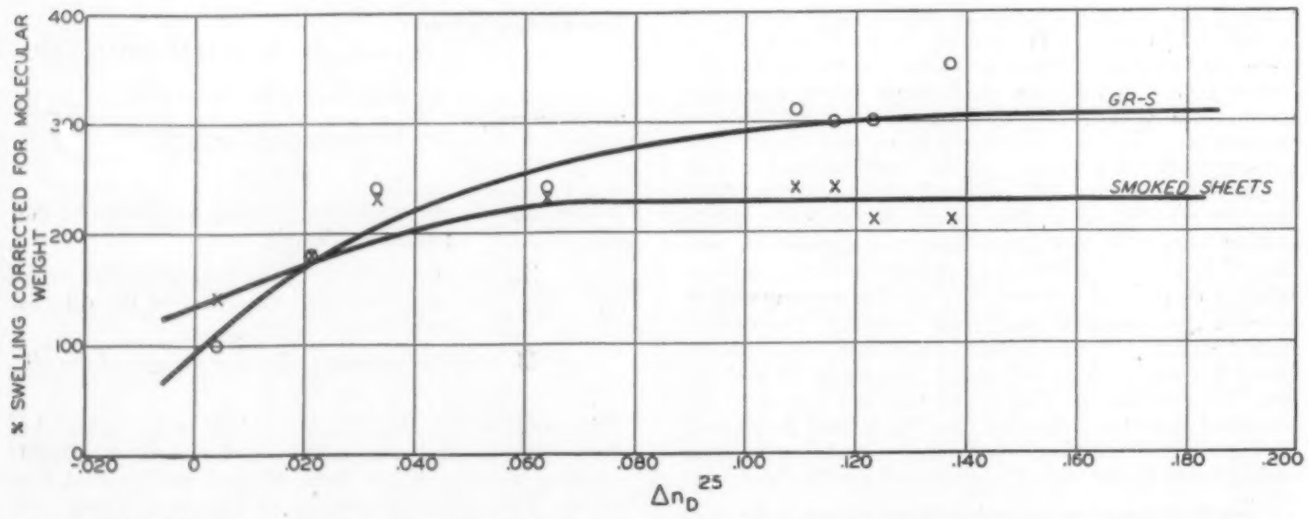


FIG. 8—Relation of Corrected Swelling Maximum in Higher Molecular Weight Hydrocarbon Mixtures to Curve for Pure Hydrocarbons.

(1) Swelling increment of both rubbers increases tremendously with temperature. This fact is easily recognizable for GR-S from the increment figures at three temperatures in the first three columns of figures in Table VI, and for smoked sheets from the figures in the last two columns of this table.

(2) Swelling increment is in all cases greater for smoked sheets than for GR-S. This is best seen from a comparison of the graphs for corresponding temperatures in Figures 3 and 4 and in Figures 5 and 6.

(3) The difference in increment value between GR-S and smoked sheets is much more pronounced with the saturated hydrocarbons than with the unsaturated. This is illustrated, for example, by the fact that the swelling increment at 120°C. of smoked sheets in the unsaturated oils is only two to three times as great as that of GR-S, while in white oil 2 it is about ten times as great, and in the solid paraffin, about thirty times as great (see figures in Table VI).

(4) The rate of increase of swelling increment with temperature is also dependent on the chemical nature of the hydrocarbons, being greater in saturated hydrocarbons than in the unsaturated oils. This is especially apparent from a comparison of the change in relative slopes of the straight portion of the time-swelling curves in Figure 4. At 60°C. the curve for unsaturated oil 1 is much steeper than those for the white oils and the paraffin; at 120°C. this is reversed.

(5) Viscosity of the oil appears to have some effect on swelling increment. A comparison of the figures in Table VI for swelling increment of both rubbers in the four unsaturated oils indicates that in oils of the same chemical type the swelling increment tends to be higher with lower viscosity.

The combined effect of the observations just enumerated results in different behaviour of the two rubbers. GR-S, at temperatures up to 120°C., exhibits higher swelling increment in the unsaturated oils, including the partially unsaturated process oil, than in the paraffinic oils. However, at 175°C., due to the relatively greater rate of increase of the swelling increment with temperature in the saturated oils, the swelling increments in all the oils are of the same magnitude. There is no longer any pronounced difference in slope of the latter portion of the time-swelling curves (see Figure 3).

TABLE VI—SWELLING INCREMENTS READ FROM FIGURES 3 TO 6.

Swelling Liquid	Swelling Increment of GR-S % in 100 Hours			Swelling Increment of Smoked Sheets % in 100 Hours	
	60°C.	120°C.	175°C.	60°C.	120°C.
Solid paraffin	0	20	800	0	620
White oil 1	0	50	1100	4	- *
White oil 2	0	50	1500	5	600
Process oil	2	230	1800	13	- *
Unsaturated oil 1	6	100	2500	15	260
Unsaturated oil 2	4	100	1600	8	260
Unsaturated oil 3	4	100	1600	6	240
Unsaturated oil 4	4	about 80	1600	5	about 170

* Disintegration of sample too rapid to permit estimation of swelling increment.

With smoked sheets all these effects are exaggerated, changing the picture completely. In the saturated oils there is such a tremendous increase in swelling increment with temperature that these oils with little swelling effect at 60°C. cause in a few days at 120°C. swelling of 400% and more, and result in disintegration of the rubber. At 175°C. the effect of the paraffin, of the white oils, and of the process oil, which contains a large proportion of white oil, can no longer be classed as swelling. After 1 hour in any of these oils the rubber specimens started to disintegrate and to disperse (indicated by broken portion of the curves). This tendency to disperse was so rapid that only 100 to 150% increase in volume of the samples occurred before the decrease in volume caused by disintegration set in. For this reason the curves at 175°C. in Figure 4 have no real quantitative significance. They serve only to indicate the solvent action of the oils. In the unsaturated oils, on the other hand, the smoked sheets specimens at 175°C. exhibited normal swelling behaviour, not too different from the behaviour of the GR-S compound, and started to disintegrate only after the volume had increased to about 500%.

TABLE VII—RELATION OF SWELLING TIME TO VISCOSITY.

Swelling Liquid	Viscosity in Centipoises (η_{cp})	Sp. Gr. 60/25	Viscosity in Centistokes (η_{cs})	Log η_{cs}	GR-S at 60°C.			Smoked Sheets at 60°C.		
					T (Time to reach swelling maximum)	$\sqrt{T}$	$\frac{\sqrt{T}}{\log \eta_{cs}}$	T (Time to reach swelling maximum)	$\sqrt{T}$	$\frac{\sqrt{T}}{\log \eta_{cs}}$
Solid paraffin	4.92	0.770	6.4	0.81	80	69.0	11.1	60	8.0	9.9
White oil 1	6.6	0.815	8.1	0.91	110	10.5	11.5	90	9.5	10.4
White oil 2	20.5	0.850	24.1	1.38	230	15.0	10.9	190	14.0	10.1
Process oil	11.0	0.895	12.3	1.09	150	12.0	11.0	115	10.5	9.6
Unsaturated oil 1	5.7	0.950	6.0	0.78	75	8.5	10.9	60	8.0	10.2
Unsaturated oil 2	11.0	0.950	11.6	1.06	140	12.0	11.3	110	10.5	9.9
Unsaturated oil 3	20.9	0.960	21.8	1.34	220	15.0	11.2	170	13.0	9.7
Unsaturated oil 4	217.	0.990	219.	2.34	680	26.0	11.1	530	23.0	9.8

TABLE VIII—COMPARISON OF CALCULATED WITH MEASURED SWELLING TIME AT 120°C.

Swelling Liquid	Viscosity in Centistokes at 120°C.	log η	Calculated Swelling Time in Hrs.		Swelling Time in Hrs. Read From Figs. 3 to 6	
			GR-S $(11 \log \eta)^2$	Smoked Sheets $(10 \log \eta)^2$	GR-S	Smoked Sheets
Solid paraffin	2.6	0.42	21	18	25	15
White oil 1	2.6	0.42	21	18	20	-*
White oil 2	4.3	0.63	48	40	about 40	about 35
Process oil	2.8	0.45	24	20	25	-*
Unsaturated oil 1	1.9	0.28	9	8	12	12
Unsaturated oil 2	2.5	0.40	19	16	20	16
Unsaturated oil 3	3.1	0.49	29	24	25	25
Unsaturated oil 4	7.5	0.87	92	76	about 70	about 70

* No reading possible because of early disintegration of the sample.

Relation of Swelling Time to Viscosity

Swelling time* is the third factor determining the time-swelling curve. In dealing with viscous oils, such as those tested in this study, the time necessary for the rubber to complete its initial rapid swelling is of considerable importance. From the time-swelling curves it can be seen how widely this time requirement varies from one oil to another. In the case of the unsaturated oils at 60°C., for instance, both rubbers in unsaturated oil 1 had completed their initial rapid swelling in three or four days, while it is questionable whether this initial swelling was complete in unsaturated oil 4 at the end of the six weeks' test.

A possibility to predict the swelling time for a series of oils, without making time-consuming time-swelling measurements, appears of interest. It is apparent immediately from the time-swelling curves in Figures 5 and 6 that this time period is related to viscosity, since with both rubbers, the heavier the oil, the slower was the swelling. It was found that by expressing the viscosity in centistokes (viscosity in centipoises divided by density†) an empirical mathematical relationship exists, in that the square root of the time in hours necessary for the rubber to complete its initial rapid swelling is directly proportional to the logarithm of the viscosity expressed in centistokes. This observation is illustrated by the figures in Table VII, where the square root of the swelling time divided by the logarithm of the viscosity is shown to be a constant. From the data in this table two equations can be set up by means of which the swelling time of either GR-S or smoked sheets can be approximately predicted from the viscosity of the swelling oil at the swelling temperature, as follows:

$$\text{For GR-S:} \quad \sqrt{T} = 11 \log \eta \qquad \text{(V)}$$

$$\text{or} \quad T = (11 \log \eta)^2$$

$$\text{For smoked sheets:} \quad \sqrt{T} = 10 \log \eta$$

$$\text{or} \quad T = (10 \log \eta)^2 \qquad \text{(VI)}$$

where T = time necessary for the rubber to complete its initial rapid swelling,

and η = viscosity of the oil in centistokes at the swelling temperature.

* The term "swelling time" is used in this paper to mean the time necessary for the rubber to complete its initial rapid swelling, rather than as defined by Scott *(4)* to mean the time to reach 50% of the swelling maximum.

† Calculations were actually made with the specific gravity given in Table II.

As with the equations for predicting swelling maximum, the two equations for swelling time were obtained empirically from the data at 60°C., which were the most accurate, more measurements having been made. However, the equations hold, at least roughly, at temperatures other than 60°C. as shown in Table VIII. In this table the swelling time for both rubbers in each oil at 120°C., calculated from the viscosity*, is compared with the swelling time read from the curves in Figures 3 to 6 for swelling at this temperature. That the measured figures do not agree better with those calculated is probably due in large part to the error involved in reading swelling time from curves plotted from as few data as those for swelling at 120°C.

Application of the Equations for Swelling Time

The equations presented are, as pointed out before, empirical, based on observations made in this investigation, and therefore applicable only to oils of the chemical character and viscosity range of those included in this study. A few additional tests were, however, carried out to check the lower limit of viscosity of the oil for which the formulas hold. These tests indicated that the formulas become quite inaccurate at viscosities below two centistokes. Since the viscosity range above two centistokes includes all petroleum hydrocarbon oils except light solvents, the usefulness of the formulas extends to most petroleum products of interest to the rubber technologist.

In using the equations it must be borne in mind that the constants in the equations are based on the size of test specimen used in this investigation**. Other size pieces would give other constants, since the rate of swelling depends on the dimensions of the test piece†. Constants can easily be determined, however, for any size test specimen by making the time-swelling measurements necessary to construct an accurate curve for one oil. The swelling time read from this curve and the viscosity of the oil at the swelling temperature substituted in the equation would give the new constant.

The ability to predict swelling time of a rubber in an oil is useful in several ways other than for the obvious value of knowing when rapid swelling will cease. It is possible, for instance, to obtain the value for swelling maximum of a rubber in a number of oils of widely different viscosity from swelling measurements made after a fixed time, even though the test period might be much shorter than the swelling time in some of the oils. With oils and temperatures where the swelling increment is small enough to be disregarded, it is possible to construct the whole time-swelling curve from one measurement. This possibility of constructing a time-swelling curve from one measurement is based on the following considerations:

(1) The time-swelling curves representing the behaviour of a rubber in liquids which cause no swelling increment, and also curves for other liquids corrected for the increment‡, all have the same shape, and thus

* The viscosity of the oils at 120° C. was estimated from the viscosities at 25° C. and 60° C. by making use of the approximation that the curve for log logη against temperature is a straight line.

** The test specimen used is of a practical size, since its dimensions are easy to duplicate by cutting the test piece from a slab cured in the A.S.T.M. mold.

† As a matter of fact, the difference in swelling time, and, consequently, in the constants in the equations for the two rubbers, probably arises from the fact that smoked sheets samples always run somewhat thinner than GR-S samples, even though the slabs from which they are cut are cured in the same mold. The constants can be looked at as containing a correction for this difference in flow during curing between GR-S and smoked sheets.

‡ A time-swelling curve from which the swelling increment has been subtracted has been termed by Scott *(4)* the "saturation curve."

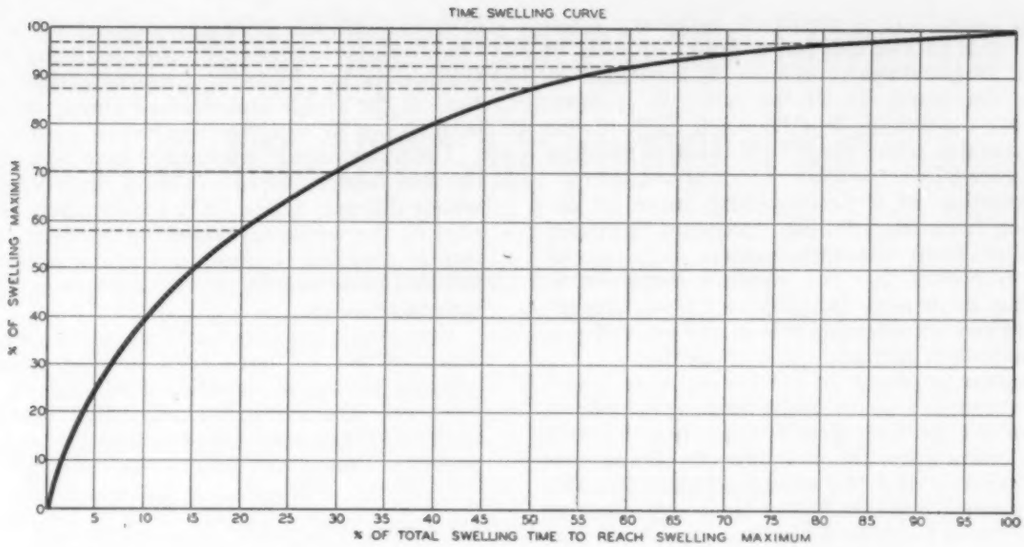


FIG. 9—Standard Time Swelling Curve without Increment for Petroleum Oils.

can all be represented by the same standard curve if the figures are expressed in terms of percentage of the swelling time and percentage of the swelling maximum.

(2) If the swelling time is known for an oil, the percentage of this swelling time represented by the test period will also be known.

(3) The percentage of the swelling maximum which has been reached after any fraction of the total swelling time, including the fraction represented by the test period, can be read from a standard time-swelling curve plotted in terms of percent.

(4) Having determined from the standard curve the fraction of the total swelling maximum attained in the test period, the swelling maximum is automatically defined.

(5) Knowing the numerical values of the swelling time and the swelling maximum, the time-swelling curve sought can be constructed to correspond in shape to the standard curve.

In Figure 9 is given a time-swelling curve in terms of percent which can be used as explained above. Several different equations have been proposed in the literature for a standard curve*. It appeared more practical to construct the curve in Figure 9 from the data measured in this investigation than to use any of these equations, especially since they are all based on investigations with lower molecular weight liquids.

The curve in Figure 9 represents a composite of the time-swelling curves for both rubbers in all the oils at 60°C. The curve was set up by correcting time-swelling data measured on all the oils for swelling increment, and then converting the data to terms of percent of total swelling time and percent of swelling maximum. These figures were averaged and used to plot the curve.

An example of the use of the curve to calculate swelling maximum in the manner mentioned above is given in Table IX. In the first column of this table are listed the swelling liquids. The percent swelling measured after 48 hours at 60°C. are given in the second column. In column 3 are listed the swelling times, calculated by means of the equation (V) from the viscosity of the oil. The fourth column lists for each oil the percentage of the swelling which is represented by the test period of 48 hours (48 times 100 divided by the figure for swelling time from the preceding column). The percent of swelling maximum attained in 48 hours given in the next column was read from Figure 9. Using this percentage figure, the values for swelling maximum in the sixth column were calculated from the measured swelling at 48 hours (swelling after 48 hours times 100 divided by the percentage of swelling maximum attained). The figures for swelling maximum read from the curves in Figures 3 to 6 are listed for comparison in the last column.

Comparison of the calculated and measured values for swelling maximum shows that an estimation of swelling maximum by this method is accurate enough for all practical purposes, eliminating the necessity for making extended measurements. The only case in which there is any great inaccuracy is with unsaturated oil 4, where the percentage of the swelling maximum attained in 48 hours is so small (31%) that any error in the original measurement would be considerably magnified in the calculation. In all other cases at least 50% of the swelling maximum had been at-

TABLE IX—CALCULATION OF SWELLING MAXIMUM FROM ONE MEASUREMENT.

Swelling Liquid	Measured Swelling of GR-S after 48 Hrs. at 60 C.	Swelling Time Calculated from Viscosity in Centistokes	% of Swelling Time $\frac{48 \times 100}{\text{Calc. Time}}$	% of Swelling Maximum Reached at 48 Hrs. (from Fig. 9)	Calculated Swelling Maximum	Measured Swelling Maximum Read from Figs. 3 to 6
Solid paraffin	50	79	61%	93%	55	50
White oil 1	65	100	48%	86%	75	80
White oil 2	45	230	21%	60%	75	85
Process oil	125	144	33%	74%	170	165
Unsaturated oil 1	230	74	65%	94%	245	260
Unsaturated oil 2	200	136	35%	76%	265	255
Unsaturated oil 3	145	218	22%	61%	240	240
Unsaturated oil 4	70	660	7%	31%	225	175

* See equations and references given by Dawson and Porritt *(9)*.

tained in 48 hours. It is obviously necessary when selecting a fixed test period for a group of oils, to select a time long enough to achieve at least half of the swelling maximum in all the oils. It is noteworthy in this connection that to reach 50% of the swelling maximum takes only 15% of the swelling time (see Figure 9).

The construction of a time-swelling curve as described earlier from the swelling maximum estimated in this manner from one measurement is a special case and presupposes that the swelling increment is small enough to be disregarded. Where the swelling increment plays any considerable role in the over-all picture, this simplified method is not applicable.

If information is sought in the general case where swelling increment is a factor in the swelling behaviour, knowledge of the swelling time is used in a different manner, but offers again the possibility to obtain complete information from a few measurements. For this method of general applicability at least two swelling measurements have to be made, both at periods of time greater than that required for the rubber to attain its initial rapid swelling to the swelling maximum. Having two such measurements, it becomes possible to construct the latter straight portion of the time-swelling curve, and thus to obtain the value for swelling maximum by extrapolation of this straight line back to zero time. The value for swelling increment is, by definition, the vertical rise of the straight portion of the swelling curve in 100 hours. The total time-swelling curve can then, again, be constructed as pointed out above for the simplified method, but the increment must be added at each point.

Summary

In continuation of previously reported studies the swelling behaviour of a vulcanized smoked sheets and a GR-S compound in mixtures of low molecular weight hydrocarbons has been investigated. The previously reported graphical method for predicting from the refractive index of pure hydrocarbons their swelling effect on the GR-S and smoked sheets compounds has been shown to apply to mixtures of hydrocarbons.

Time-swelling measurements have been made at three elevated temperatures in heavy hydrocarbon oils of widely different types. It has been shown that a knowledge of the whole time-swelling curve at the temperature in question is essential for any prediction of the swelling behaviour of the two rubbers in oils of higher molecular weight.

Empirical equations based on easily measured properties of the oil have been derived which, together with the previously established relationship of swelling effect to refractive index, allow the construction of a reasonably accurate time-swelling curve from a few properly chosen swelling measurements.

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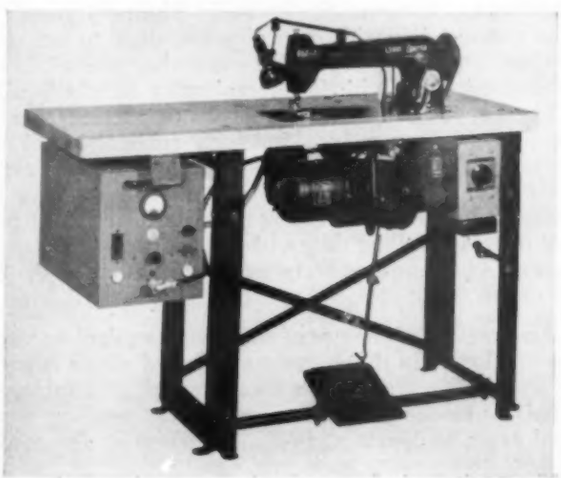
Electronic Seamer for Thermoplastic Films

A NEW line of machines for electronic seaming of thermoplastic film materials, such as Vinylite, Pliofilm, Koroseal, and Saran, has been developed by Union Special Machine Co., 425 North Franklin St., Chicago, Ill. A typical unit in this line, shown in the accompanying illustration, is equipped with an RCA 200 megacycle (200,000,000 cycles per second) constant frequency power generator. Power is supplied to rotary type electrodes at the seaming head.

The machine has sufficient power to seal ten thicknesses of .004-inch vinyl film or two thicknesses of .020-inch film. Power is taken from any ordinary 110-120 volt, single phase, 60 cycle A.C. line capable of supplying 13 amperes. The controls include a conventional treadle connected to a ⅓ h.p. clutch-type motor which drives the seaming head. The same treadle also controls the off-on switch for high frequency power to electrodes. Seam widths ranging from 1/16 inch to 1/4 inch may be obtained by changing the top electrode.

The distinctive feature of this machine is claimed to be its ability to produce the fused seam in a silent, continuous operation in contrast with machines which use bar-type electrodes for intermittent step-by-step sealing. This same principle has also been applied to a "feed-off-the-arm" seamer for producing tubular sections continuously in any length.



Some New Applications for Glycerine in the Over-All Rubber Field

By GEORGIA LEFFINGWELL and MILTON A. LESSER

Glycerine Producers' Association, 11 West 42nd St., New York 18, N. Y.

FEW substances find so many varied uses in rubber processing and treatments as does glycerine, both in this country and abroad *(1)*. Those who have followed new developments in this field know that glycerine continues to extend its usefulness.

The importance of glycerine to the rubber industry can be gauged from the amount used in rubber processing. In 1941, the last year before the war, about 1,802,000 pounds were used for such purposes *(2, 3)* and current estimates suggest that considerably more, about 2,300,000 pounds, will be used during 1946 *(4)*. These figures do not include the large quantities that enter the rubber industry via alkyd resins and other glycerine derivatives, as well as glycerine-utilizing compounds.

Heated glycerine baths have often been advocated as media for vulcanizing rubber, especially where continuous processing is indicated. An adaptation of this principle has recently been utilized by Ryan *(5)* in a process for the continuous formation of latex filaments or threads. In the method described in his patent, a stream of heated glycerine is discharged into a relatively small tube at such a rate that the glycerine moves with a viscous flow. A thin, continuous, liquid stream of latex is discharged into the center of the stream of glycerine which acts as a hardening agent. The latex moves at the same speed and in the same direction as the glycerine. The glycerine thus serves both as the support and hardening or coagulating medium for the latex.

The heat-hardened latex is withdrawn from the glycerine in the form of a fine thread, the filament going on to a cooling and washing bath. The glycerine flows into a sump, is pumped into a heater and passes on to a tank from which it is again employed to support and harden more latex. By varying the size and shape of the orifice through which the latex flows into the glycerine it is possible to obtain filaments of different thickness and cross-section.

Being a safe and efficient lubricant for rubber, glycerine is often used on moving or supporting rubber surfaces, and in media for preventing the adhesion of shaped rubber to molds during vulcanizing or other forming processes. An example of its use, in conjunction with talc, for preventing the adhesion of rubber is given in the following patented *(6)* preparation:

Talc	64.0%
Water	35.5%
Glycerine	0.5%

Applied as a slurry, the mixture is allowed to dry. It is claimed that the glycerine, which is hygroscopic and non-volatile, renders the lubricating talc more adherent to the rubber surfaces.

The plasticizing action of glycerine, which finds a number of uses in rubber processing, may be employed also in making materials of value to the industry. Thus, a protective sheet for rubber may be made by plasticizing a self-sustaining sheet of water-soluble polyvinyl alcohol with glycerine. The sheet so formed is used in place of holland cloth for protecting unvulcanized rubber surfaces *(7)*.

This and other properties of glycerine are often utilized to improve the characteristics of rubber-containing products. An example is given in Halls *(8)* process for making an improved puncture-sealing composition that remains effective over an indefinite period and through hard usage and temperature variations. A typical formula for such a compound, which naturally distributes itself uniformly over the inner surfaces of the tube, follows:

	Parts
Cold swelling starch	12.0
Glycerine	60.0
Water	55.0
Asbestos fiber	3.0
Salt	8.0
Granulated rubber, 20 mesh	7.0
Granulated rubber, 80 mesh	4.0
Water-soluble dye	0.5

In explaining the function of this rather high proportion of glycerine, it is pointed out that it provides the requisite elastic properties, prevents freezing in cold weather, maintains the composition suitably moist and uniform during hot weather because of its hygroscopicity, and assists in preventing leakage of excess moisture through the puncture. The composition is easily injected into the tube through the air inlet valve, inflation of the tube serving to clean the valve.

Glycerine is an excellent vehicle for many chemically active substances. As indicated in a patented process *(9)*, this property may be utilized in the production of chemical blowing agents for making expanded rubber. Thus, glycerine is suggested as a reaction medium in which ammonium nitrate decomposition results in the liberation of nitrogen gas. Such solutions of ammonium nitrate, being substantially non-aqueous, are said to be superior gassing agents for making expanded rubber of both the cellular and the sponge types. The process is applicable to soft or hard rubber.

The manufacture of artificial rubbers calls glycerine into use *(10)* as a plasticizing agent, as a softener, or for providing other desirable characteristics; the amount employed varying with the effects desired. Indicative of how it may thus be employed is a complex mixture, of British origin *(11)*, for making a rubber substitute for coating textiles. This rubber-like material is made by mixing the following:

	Percent
Water	23.0
Gelatin	20.0
Vegetable gelatin	3.0
Sulfonated castor oil	0.5
Mineral oils	0.5
Boiled linsced oil	2.3
Tung oil	2.0
Oleic acid	0.3
Asphaltum	20.0
Manila copal resin	0.5
Gum thus	0.5
Calcium chloride	8.0
Zinc chloride	3.5
Glycerine	0.5
Methylene oxide	4.6
Organic filler	5.3
Calcium carbonate	5.0
Chrome alum	0.5

Of course, glycerine's utility also extends to the processing and treatment of synthetic rubber. In a Russian process *(12)* patented in 1940 glycerine is added to synthetic bivinyl latex to increase resistance to frost. This recalls another Russian patent *(13)* which describes how vulcanization accelerators are prepared by heating an alkali metal sulfide with rosin, glycerine, or glucose.

Chemical reactions of glycerine which result in the synthesis of alkyd type resins are of recognized value in rubber processing. These alkyd resins, the basic components of which are glycerine and phthalic anhydride, may be modified in various ways. The rubber industry has found many applications for these resins *(14)*, and newer developments continue to extend their value.

Chlorinated Rubber-Resin Blends

For a number of years, combinations of chlorinated rubber and alkyd resins have been recommended in preparing a variety of products, especially coating compositions. An example is indicated in a patented method *(15)* in which a specially modified, liquid alkyd resin is used as a plasticizer for a coating composition comprising chlorinated rubber as the principal film-forming constituent. The composition also contains polymerized vinyl acetate in varying amounts. Considering the frequent conjunct use of chlorinated rubber and alkyd resins, it is not surprising that methods *(16)* have been developed to prepare chlorinated rubber of improved compatibility with alkyd resins.

While on this subject, mention should be made of the use of glycerine borate for improving the characteristics of halogenated rubber such as chlorinated rubber. In lower proportions, preferably about 5 per cent, glycerine borate greatly retards deterioration and reduces attack on the base materials (e.g., cloth or metal) to which the rubber is applied. In higher ratios, the glycerine compound not only acts as a fire retardant to prevent smoldering of combustible bases, but also serves as a plasticizer to increase flexibility. Since the glycerine borate is not soluble in hot rubber, the rubber is treated with suitable solvents and the glycerine compound is kneaded into the mass and thoroughly disseminated. Halogenated rubber prepared in this way is especially suitable for use in making flexible and fireproof curtains, for producing fire-retardant curtains for the home, welders' frames, locomotive cabs and the like, for impregnating paper and cloth, and for coating wire *(17)*.

Returning to the alkyds, consideration may be given to the use of these resins in improving synthetic rubbers. In one case *(18)*, an aqueous suspension of synthetic rubber particles is mixed with a similar suspension of a plastic composition. This last is obtained by the reaction of an oil-modified alkyd resin with a urea-formaldehyde condensate. The dispersions so obtained have superior properties with regard to flexibility, toughness, tack, gloss, aging, and grease resistance. They are used for impregnating and coating woven and felted fabrics, for base coats for artificial leather and oil cloth, and for coating paper.

In another instance *(19)*, a mixture of modified alkyd resin and a specified condensate is employed as an addition agent for synthetic rubber. Incorporating this mixture in the product relieves its dryness, hardness, leatheriness, and resistance to handling on a rubber mill.

Manufacture of Rubber Substitutes

It should be pointed out that alkyd resins have been used in making rubber substitutes. In one recent example *(20)*, such a resin is milled with smaller proportions of condensate formed from formaldehyde, an aliphatic alcohol, and either a carbamide or an amino-triazine to form tacky, elastic, crumbly, rubber-like materials suitable for adhesives, coated fabrics, or rubber compounding.

Other glycerine derivatives have found useful application in the rubber industry. Davis *(21)*, for example, has recommended the use of the tributyl ester of glycerine triphthalate as a plasticizer and softening agent. Other complex glycerine derivatives have been developed by this worker *(22)* for softening rubber-like compounds. Glycerine esters of tall oil have been studied by Harber and Yoran *(23)* as plasticizers for GR-S. Marple *(24)* has suggested the use of an ether of di-glycerine as a softening agent for certain synthetic rubber compositions.

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RECENT ADVANCES IN THE PHYSICS AND CHEMISTRY OF RUBBER

2—The Relation Between the Swelling and the Mechanical Properties of Vulcanized Rubber

By GEOFFREY GEE

The British Rubber Producers' Research Association, Welwyn Garden City, Herts., England

RELATIONSHIPS between swelling and mechanical properties may be of three kinds: (a) empirical, based solely on the results of observation, (b) thermodynamic laws of general validity, independent of any assumption as to the origin of the phenomena, and (c) relations arising from statistical treatments based on specific molecular models. It is with the third type of approach that this paper is mainly concerned.

The properties to be considered may in principle be divided into two classes, (a) static, and (b) dynamic, although in practice it is often difficult to be sure that the system is in a state of true equilibrium. The first category includes elastic moduli, maximum swelling, and solubility; the second, creep, stress relaxation, and rate of swelling. Measurements of dynamic properties suitable for quantitive discussion are at present meagre, and only a very qualitative account of this part of the problem can at present be attempted.

On the other hand, reasonably satisfactory statistical theories have been developed, by which the equilibrium properties of rubber can be fairly accurately described. These will be shown to predict (a) a definite relationship between the elastic modulus of a vulcanized rubber and its equilibrium swelling in a given liquid, (b) the effect of swelling on mechanical properties, and (c) the effect of mechanical deformation on equilibrium swelling.

The basis of these theoretical treatments is the representation of the molecular state of the system by a suitable model. The two requirements to be satisfied by any possible model are (a) that it shall be sufficiently simple for mathematical analysis, and (b) that it shall retain the essential features of the real system.

Molecular Nature of Rubber

Earlier lectures have discussed the molecular nature of rubber, and the conclusion has been drawn that a rubber molecule is long and chain-like, possessing a high degree of flexibility. Any selected short section of the molecule is surrounded by portions of other molecules (or of another part of the same molecule). If liquid is present, one or more of the neighbors of the selected section may be a molecule of liquid. All these molecules are in constant motion, by virtue of their thermal energy, the motion becoming more violent as the temperature is raised. The motion is restricted by the existence of strong forces between the molecules; these have the effect of fixing the number of neighbors of the selected section and the average intermolecular spacing within fairly small limits. Within these limits the molecules vibrate; relatively infrequently they separate sufficiently to slide bodily over one another. In vulcanized rubbers a further limit to motion is imposed by the existence of chemical links between the molecules at certain points, linking them into a more or less compact network.

Rates of Deformation and Swelling

Before proceeding to discuss how these molecular properties may be represented by means of simple models, we may note the ways in which they will determine the rates of deformation and swelling. It is obvious that both mechanical deformation and imbibition of liquid involve the relative movement of molecules or portions of molecules. Before such a movement can take place the close packed structure in the vicinity must be expanded to some extent, and this will occur from time to time when random thermal motions con-

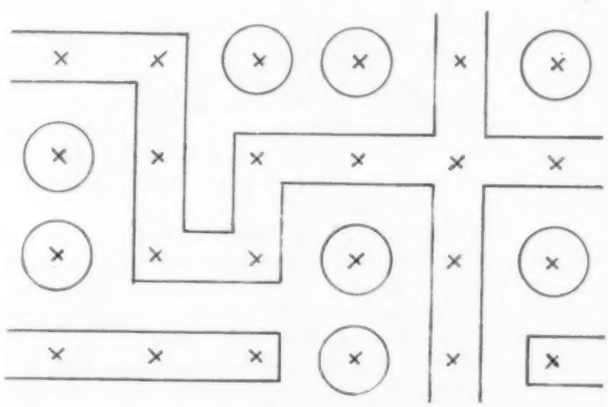


FIG. 1—Lattice model, showing 24 lattice points (X) of which 8 are occupied by liquid (represented by circles) and the remainder by rubber chains. One junction point is shown.

Note: This paper is one of a series based on lectures delivered during 1945-46 by members of the staff of the British Rubber Producers' Research Association at Newton Heath Technical School, Manchester, or before the Leicester Section of the Institution of the Rubber Industry, or under the auspices of the Extra Mural Department of the University of Birmingham.

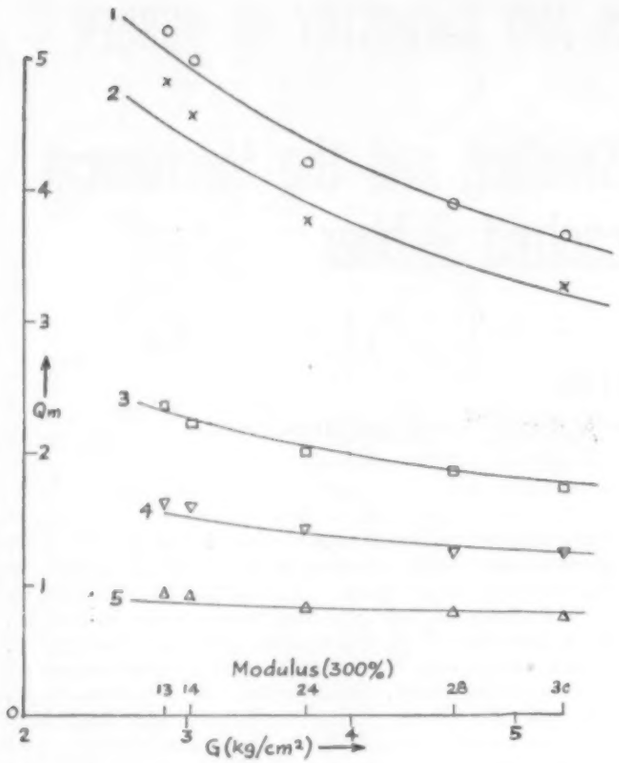


FIG. 2—Dependence of maximum swelling (Qm) on G (kg./cm.²) and "modulus" at 300% extension. Curve 1, carbon disulfide; 2, benzene; 3, 40/60 petrol ether; 4, n-propyl acetate; 5, ethyl acetate Curves are calculated from equation (2).

centrate sufficient energy in this region. The precise way in which this happens is not at all clearly understood, but it is evidently roughly related to the process of evaporation, in which a molecule has to be detached completely from its surroundings.

It has been shown *(v)* that the energy of activation for the viscous flow of most liquids is from one-third to one quarter of the latent heat of evaporation. Comparing a series of rubbers, it is therefore to be expected that those in which the intermolecular forces are highest will deform and recover from deformation most sluggishly. This is well known to be qualitatively true, and is shown in the relatively "lazy" behavior of some of the synthetics. It is not to be expected that this will be the only factor involved in determining the rate of response to applied stresses. The geometrical packing of the chains and the extent to which they are locally aligned must also be important, but no quantitative treatment is yet possible.

The factors governing the rate of swelling are essentially similar, but the situation is more complex in that the resistance to flow of liquid through the structure will diminish as the rubber swells. Although empirical equations for the rate of swelling have been suggested *(2)*, no analysis of the diffusion equations has been made, save for the case in which the degree of swelling is so small that the diffusion constant can be treated as independent of concentration. Under these conditions the rate of diffusion should be correlated with the rate of response to mechanical stresses, but with increased swelling, the controlling effect of the intermolecular forces and structure of the rubber rapidly disappears, and the rate of swelling becomes dependent mainly on the properties of the liquid. Thus, e.g., the molecular volume of the liquid has a very large effect, large molecules diffusing much more slowly than small ones.

It will be seen therefore that it is not at present possible to give any accurate description on the molecular scale of the way in which rubber swells and deforms. The description of the equilibrium state of rubber under specified conditions is considerably easier, and two different molecular models have been used for this purpose. The first may be termed the vector model and represents a molecule by a series of lines joined together at certain points into a network and having length and direction, but no thickness. These are free to rotate, so that the molecule can take up a large number of configurations, in most of which it will be relatively highly kinked.

Theory of the Deforming Force

It is supposed that in the undeformed state of a piece of vulcanized rubber, the part of a molecule lying between any consecutive pair of network junction points is kinked up to its most probable length. When the rubber is deformed, each such length of molecule is forced out of this most probable arrangement, and therefore tends to return to it, through the agency of its thermal energy, as soon as the deforming force is released. Treloar *(3)* has described the various attempts which have been made to derive from this model an expression for the work done in deforming the rubber, and has shown that they may be generalized in the form:

$$W = \tfrac{1}{2}G\ (\lambda_1^2 + \lambda_2^2 + \lambda_3^2 - 3) \qquad (1)$$

where W is the work done in deforming a unit cube to a block whose sides are λ_1, λ_2, λ_3.

G is a constant, related to the density ρ of the rubber, the molecular weight Mc between junction points, the gas constant R, and the absolute temperature T, by the equation $G = \rho\ RT/Mc$.

This model ignores intermolecular forces; the second one gives them a central position. The fact that these forces impose a rather definite arrangement of the immediate neighbors of any selected portion of a molecule is recognized by treating the whole system as quasi crystalline. A regular lattice is defined by fixing the number of first neighbors of any selected point, and by taking the distance between lattice points equal to the mean intermolecular spacing. A rubber molecule is then assumed to have sufficient flexibility to take up any geometrically possible configuration defined by a continuous series of nearest neighbor lattice points. If liquid is present, a molecule of liquid is considered to occupy a single lattice point, giving an arrangement such as that shown, for a square lattice, in Fig. 1.

The swelling of a rubber in a liquid can be treated quantitatively by means of this model. The tendency of the liquid to distribute itself uniformly throughout the rubber by virtue of its thermal energy *(4)* can be evaluated by computing the number of configurations of the system in which the rubber and liquid are (a) mixed, and (b) unmixed; it is evident that the former will be far more numerous. This calculation is most easily carried out on the assumption that all configurations are equally probable, but in general this will not be true. Mixing the rubber and liquid involves changes

of intermolecular forces, and it is usually found that a molecule of liquid in contact with rubber is in a state of higher energy than if it were surrounded by liquid molecules.

The various configurations should therefore be weighted according to their different energies, and this has recently been accomplished *(5)*. When mixing is accompanied by a large increase of energy, only a very limited degree of swelling occurs, and the amount of swelling is almost independent of whether the rubber is vulcanized or not.

The factors which determine the magnitude of this energy change have already been described *(4)* and will not be considered here. When it is small, or zero, swelling is controlled mainly by the degree of vulcanization. As the liquid enters the rubber it has to do work in distending the network. This work, which can be calculated from equation (1), ultimately becomes large enough to balance the tendency of the liquid to enter the rubber, and swelling then ceases. It can be shown *(6)* that the maximum swelling Q_m in a given liquid of a series of similar rubbers cured to different extents are related to their elastic constants G by the equation

$$\ln (1 + 1/Q_m) = (Q_m + 1)^{-1} + \mu (Q_m + 1)^{-2} + G/RT(Q_m + 1)^{1/3} \qquad (2)$$

where μ is a constant, and Q_m is the relative volume of liquid to rubber. Fig. 2 shows how well this equation holds for a series of natural rubber compounds in several different liquids.* In other words, within such a restricted series, the maximum swelling is a definite function of G. The "modulus" at 300% extension as measured on a standard tensile testing machine is found to be approximately proportional to G, as shown in Fig. 2, so that maximum swelling is also a function of the "modulus."

We now consider what happens when a piece of rubber is subjected simultaneously to mechanical deformation and to the effect of a swelling agent. This question has been examined theoretically by assuming the two agencies to act independently, in which case it is still permissible to use equation (1) to calculate the work of deformation, whether produced mechanically and/or by swelling. Two problems arise, and both are readily solved in this way:

(a) *The Effect of Mechanical Deformation on Swelling Capacity:* In the case of unidirectional extension or compression, it is found that equation (2) has to be replaced by:

$$\ln (1 + 1/Q_m) = (Q_m + 1)^{-1} + \mu (Q_m + 1)^{-2} + \text{Glo/1RT} \qquad (3)$$

where l_o is the length of the rubber (in the direction considered) when dry and undeformed, and l its length when swollen and deformed. Comparing equations (2) and (3), it is easily seen that extension of a rubber should increase its swelling capacity, while compression should reduce it. The results of an experimental test of this conclusion, for the case of extension, are given in Fig. 3, and the prediction is qualitatively confirmed. The quantitative discrepancy found for ethyl

(Continued on Page 107)

* For reasons which will appear later, the values of G used in this plot were obtained from the elastic behavior of highly swollen rubbers.

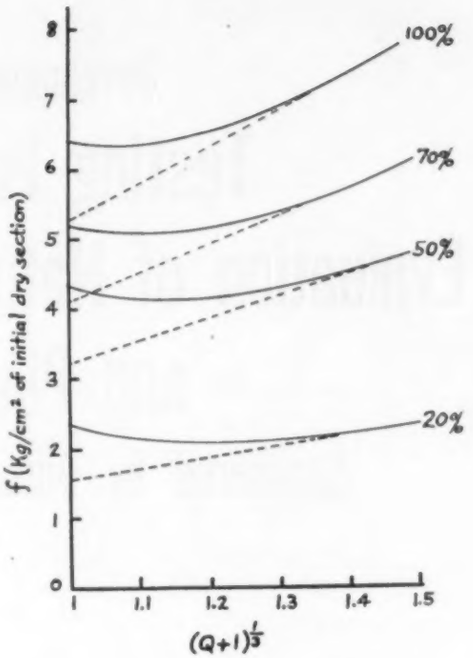


FIG. 4—Dependence of tension (f) on degree of swelling (Q) at constant extension (marked on curves). Dotted lines are theoretical.

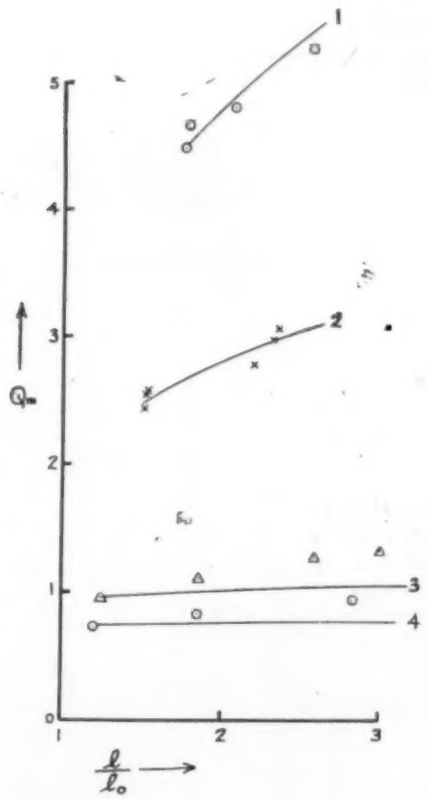


FIG. 3—Dependence of maximum swelling (Qm) on elongation. Curve 1, benzene; 2, 40/60 petrol ether; 3, ethyl acetate; 4, methyl ethyl ketone. Curves are calculated from equation (3).

Developments in the Field of Testing Procedures for the Evaluation of Natural and Synthetic Rubbers and Plastic Elastomers

Sponsored by Bureau of Ships, Navy Department

Part VI

By THEODORE A. WERKENTHIN

Prirncipal Materials Engineer, Bureau of Ships, Navy Department, Washington, D. C.

DIFFUSION TESTING APPARATUS

In this classification are given those tests which have to do with the diffusion of gases or liquids through rubber and synthetic rubber either alone or in combination with various fabrics or reinforcements. In some instances actual perforations are being tested for, but in others the diffusion is through homogeneous "perfect" layers of rubber or rubberized fabric.

Hydrostatic Test for Hard Cellular Rubber for Floats: In the evaluation of molded hard cellular rubber used in various types of flotation equipment, a method was required whereby the diffusion of water through the thin walls of hard cellular rubber could be determined, as well as modifications in the shape of the hard cellular rubber caused by collapse of cell walls due to external hydrostatic pressure. A simple test for determining these properties was developed by Mr. Chatten of the Material Laboratory, Navy Yard, New York, and is illustrated in Fig. 77. The apparatus used in the test consists of a pressure vessel, of sufficient size to hold the cellular rubber specimen and strong enough to withstand a pressure of 300 pounds per square inch. Side connections are provided which are connected to a standard gage sight glass, and other connections on top of the bomb are provided for the inlet and outlet of the air pressure. The cellular rubber is weighed, and the volume is computed from the dimensions by conventional methods. The sample is then attached weighted down with lead weights and immersed in the water of the bomb cylinder. After the cover of the cylinder is secured in place, all air is expelled from the cylinder by replacement with water and the desired pressure is applied through the needle valve at the upper end of the gage. The volume and pressure of the contents of the bomb chamber is recorded periodically. The decrease in the water level indicates the degree of absorption of water by the sample. In this one determination, both the increase in weight and the change in volume of the sample are determined.

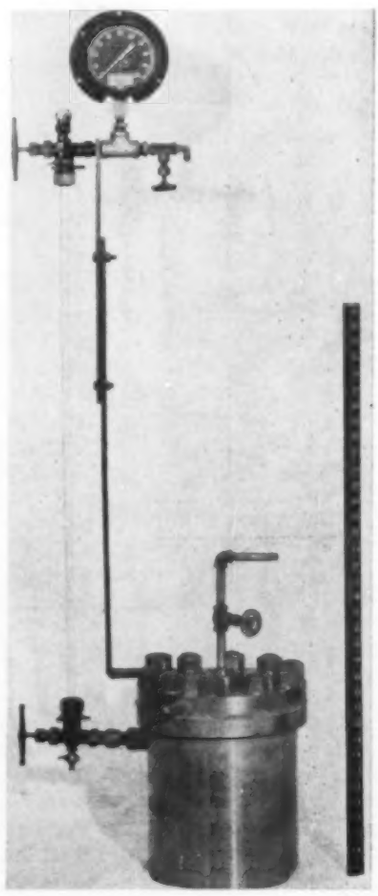


FIG. 77 — Apparatus for making hydrostatic test of cellular hard rubber discs.

Inflation and Porosity Test for Rubber Gloves: Some time ago, when the shortage of rubber was at its worst, a large quantity of rubber gloves for acid use had been rejected because of surface imperfections, such as protuberances, "snap backs," weak spots, and imbedded fine matter. In order to determine whether these superficial visual defects were of sufficient significance to affect the serviceability of the gloves, a simple inflation test was devised by the author. The apparatus used consisted of a hollow wooden shank, 3 inches long, tapered on the outer surface to fit the open end of the rubber glove. A steel ring, tapered on the inner surface, was constructed to fit over the wooden shank. The shank was attached to a steel base plate to make an air-tight joint and the tapered ring was bolted to the base plate so that it could be tightened over the shank. This base plate was fitted with a quarter-inch brass pipe to which in turn was attached a tire inflation valve, an air pressure gage, and a pressure relief valve. This apparatus is shown in Fig. 78.

Air is introduced into the glove in sufficient quantity to fill out the glove and to provide slight additional pressure. The inflated glove is immersed in water and porosity determined as indicated by the formation of air bubbles. In addition to the porosity test, the glove is further inflated until the circumference at a point midway between the edge of the cuff and the tip of the forefinger is 55 inches. This degree of inflation is sufficient to permanently injure the texture of the rubber and is used only to determine the seriousness of the above-mentioned defects which are visually detected in the glove. The contention is that any glove which can thus be excessively distended would be satisfactory from the standpoint of maintaining tightness for average wear. A modification of these tests is now being incorporated in Bureau of Ships Specification 37G2, for gloves of this type. While this test was initiated during a time when the shortage of natural rubber latex resulted in the use of inferior grades of latex which produce a large number of visual imperfections, it was felt that this test is of sufficient importance to utilize in present day procurement.

Modification of Permeability to Pressure Flow of Coated Fabrics to Water and Other Liquids of the Suter Water Permeability Tester: Where it is desired to determine permeability of rubberized fabric to other than water, a modification of the Suter apparatus illustrated in Fig. 79 has been used. As can be clearly seen

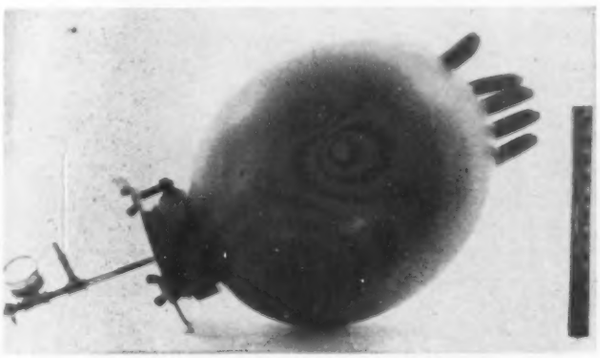


FIG. 78—Rubber glove inflated for inflation test.

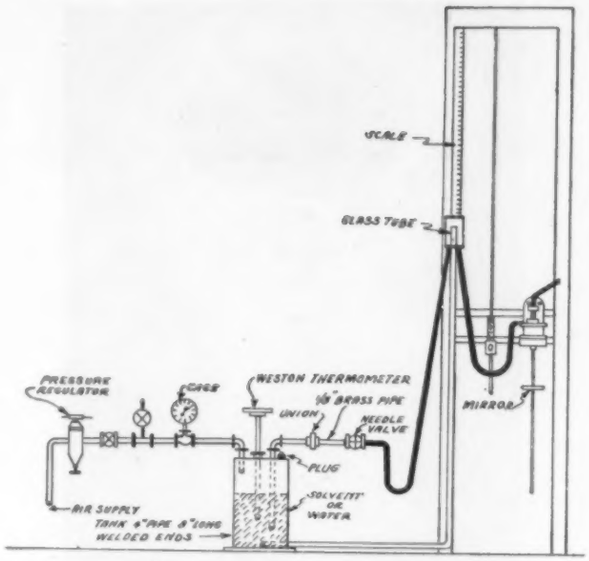


FIG. 79—Modified Suter diffusion apparatus.

in these illustrations, the permeability can be accurately determined by means of forcing any desired liquid under air pressure to the liquid level of the permeability apparatus. This equipment has been found of considerable advantage in determining permeability to hydrocarbon solvents, such as aromatic gasoline, carbon tetrachloride, etc.

Test to Determine Permeability of Vapor or Liquid Through Fabrics: In the testing and development of collapsible water breakers, flexible gasoline tanks, etc., it became necessary to develop a simple vapor and liquid diffusion test for coated fabrics. The Rubber Laboratory, Navy Yard, Mare Island, developed a simple test which except for size of equipment may be used for liquid or vapor permeability. Suitable apparatus for the former is shown in Fig. 80, the one for the latter in Fig. 81.

A quantity of liquid is weighed into the cup, the ring and fabric is securely fastened by twenty 4/48 screws. The cup is inverted so the liquid is in contact with the fabric. By placing the cup in different atmospheric and temperature conditions, it is possible to determine permeability under a variety of conditions. In the vapor test very minute weight losses are experienced and hence a much smaller apparatus is employed which may be weighed on a sensitive analytical balance to determine loss of vapor through the fabric. Great care must be exercised in handling the cup that none of the liquid "wets" the fabric during the entire test.

WEAR AND ABRASION TESTS

Wear Test on Hose and Other Circular Shaped Rubber Materials: The natural rubber shortage has brought changes in the method of permanently marking or branding of rubber materials. In lieu of the so-called inlaid brand, a flat vulcanized type of brand was submitted. In order to determine the relative serviceability of various methods of branding hose, an ap-

FIG. 80—Aluminum cap for liquid diffusion test.

paratus was developed which accomplished this purpose. A section of the branded material was fastened on a rotating drum. An abrasive paper strip is held in place over the rotating drum holding the brand. A light strap horizontally tangent to the outside of the hose section is used as a fastening for the strip of aluminum oxide abrasive paper. The abrasive paper is made to bear on the hose by means of a suitable weight hanging from the free end of the strip. It is necessary to employ a low rate of rotation in order to avoid heating of the rubber which would have an undesirable influence on wear, and would not duplicate service conditions. The reproducibility of this method is quite satisfactory. The results may be measured either in length of time required to render the brand illegible, or in the amount of material abraided in a given length of time. The test is usually conducted on the unaged sample and tests are repeated on samples which have been subjected to accelerated light, to oxygen bomb aging, or any other accelerated aging tests. This test was developed by Joseph R. Conway of the Material Laboratory, Navy Yard, New York.

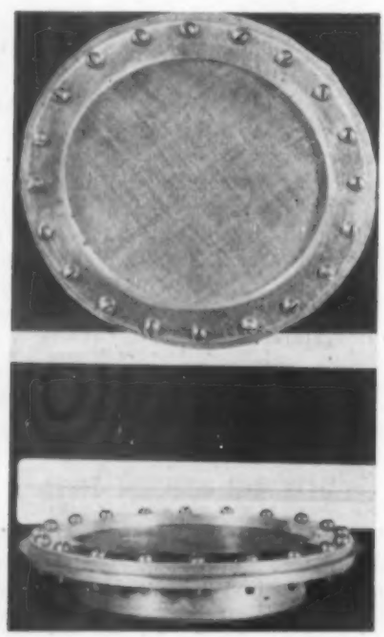


FIG. 81—Water vapor diffusion apparatus.

Wear Test of Plastic and Rubber-Like Materials Used in Walk-Way Surfaces: An ingenious machine for the accurate measurement of abrasion was recently described by Cizek, Kallas, and Nestlen*. This apparatus was prepared at the request of the writer in connection with a comprehensive evaluation of decking materials of various types of rubbers, plastics, and mixed organic-inorganic compositions. However, this test has found application in the measurement of rubber or plastic materials, such as covers for binoculars and other relatively hard natural and synthetic rubber surfaces. For example, it will be of service in evaluating abrasion resistance of rubber-bearing surfaces, such as bearings for strips and full molded bearings. Complete photographs of this equipment are shown in the above-mentioned reference; however, for the sake of completeness one illustration is included in this summary (Fig. 82).

SWELLING AND IMMERSION TESTS

Technique for Determining Effect of Solvents on Hose, Tube and Cover Stocks: A convenient method of determining the effect of solvents on rubber and synthetic rubber is to measure some other characteristic after the material has been subjected to immersion in the particular solvent which is to be tested. Con-

* Cizek, Kallas and Nestlen, "A New Machine for Measuring Wear Resistance of Walk-Way Materials," *A.S.T.M. Bull.*, No. 132 (Jan. 1945).

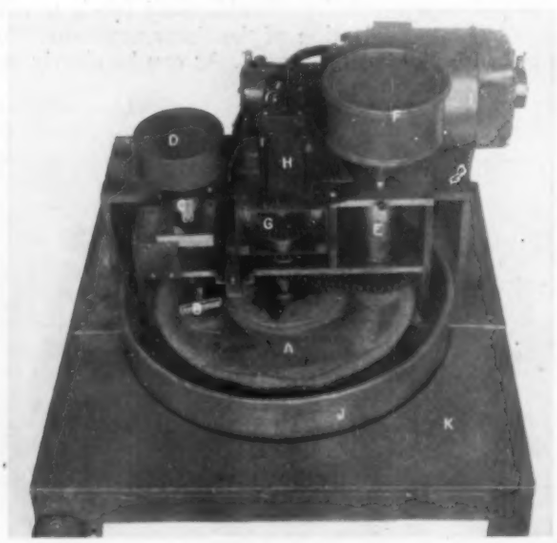


FIG. 82—Detailed view of wear test machine.

ventionally, the change in volume has been utilized for this purpose; however, it was determined† that a modification in brittleness of the rubber material at low temperatures was as good or perhaps a better indication than the change in volume. The particular method selected for this brittleness test was a modification of the Selker and Kemp method previously described under rheological properties at low temperatures. The effect on the brittleness on immersion in various solvents after certain periods of time of five different types of synthetic rubbers is shown in Fig. 83.

Determination of Volume Increase of Vulcanized Rubber in Solvents: A rapid method for the determination of volume increases of vulcanized rubber in various types of solvents was developed by Mr. Hess of the Industrial Laboratory, Navy Yard, Mare Island, who describes this apparatus in some detail‡. The apparatus essentially consists of a narrow rectangular vessel having a long narrow glass tube connected with it near the bottom and set at a slight angle with the horizontal, similar to a draft gage tube. A slight displacement of the liquid in the vessel causes a large linear displacement of the level in the glass tube. By introducing rectangular pieces of rubber cut from ordinary test slabs into the vessel containing a liquid, the displacement caused by such samples can be read from a suitable scale placed behind the glass tube. After calibration of the apparatus, very rapid determinations can be made.

Rubber Glove Finger Swelling Test: In testing sections cut from rubber gloves, the contention was frequently made that such a test would not be indicative of the true performance of the glove under service conditions. As a result, the Material Laboratory, Navy Yard, New York, developed an accurate test for determining swelling which at the same time would simulate service conditions more closely.

The apparatus for the test is shown in Fig. 84. The forefinger is removed from the sample glove and turned inside out. The upper end of the finger is fitted over the end of a 2½" length of glass tubing, so that the tube forms a funnel surmounting the glove finger, and is taped in place to prevent leakage. The glove finger and tube is filled with a solvent, the resistance to which it is desired to determine. The glass tube is stoppered lightly to prevent excessive evaporation of the solvent during the test. The initial volume of the glove finger is measured by immersing the forefinger of the glove in water to the lower edge of the glass tube. Volume increase of the glove finger is measured after subjecting the glove finger for the desired length of time to the effect of the solvent. Another advantage of this test is that the solvent comes in contact with only one side of the rubber glove such as is the case in actual service. Conventional types of swelling tests are made on specimens where the entire surface is exposed to the solvent.

This test also serves as a permeability test by slightly modifying the apparatus, that is, closing the stopper tightly and then weighing the assembly from time to time to determine the degree of diffusion of the solvent through the rubber. It has also been used successfully in determining the swelling characteristics of rubber and synthetic rubber in chromic acid, sulfuric acid, hydrochloric acid, and various types of organic solvents.

Dual Life Belt Immersion Test: It became desirable to develop a simulated service test which would subject dual tube life belts to the action of gasoline, oil and salt water such as would be expected to be found if a vessel were torpedoed and personnel had to jump

† Morris, James, Caldwell and Werkenthin, "Effects of Petroleum Products on Synthetic Vulcanizates," *R.A. (N.Y.)*, Vol. 53, No. 4 (July, 1943); Morris, James, Berger and Werkenthin, "The Effect of Petroleum Solvents on the Cold Resistance of Synthetic Vulcanizates," *I.R.W.*, Vol. 108, No. 6 (Sept., 1943).

‡ "Vanderbilt Rubber Handbook," pp. 320-21 (1942).

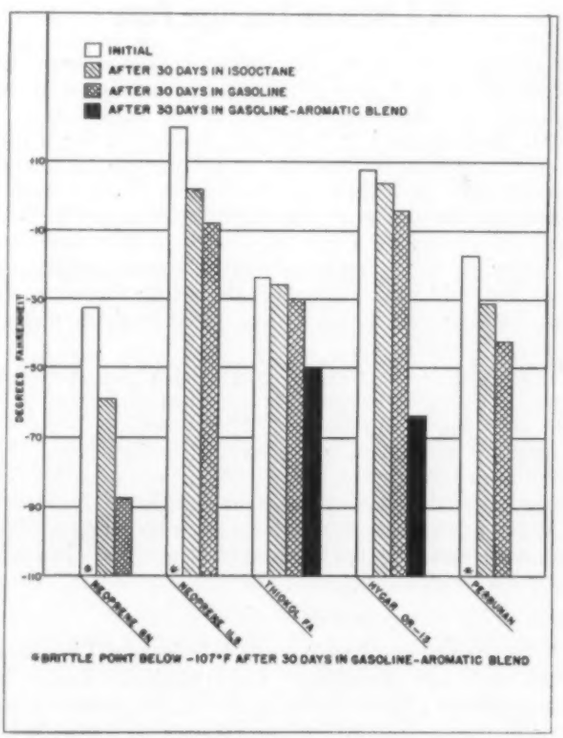


FIG. 83—Effect of immersion on brittleness.

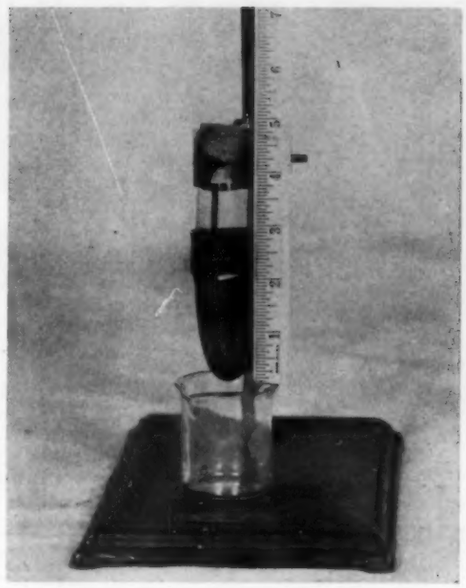


FIG. 84—Apparatus for glove finger swelling test.

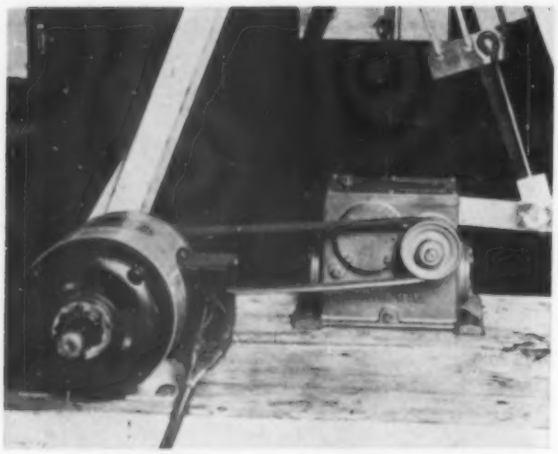


FIG. 85—Eccentric for immersion of dual tube life preserver.

FIG. 86—Apparatus for life belt immersion test.

overboard from the sinking ship. In order to simulate these conditions, Dr. Fore and Dr. Swenson of the Naval Research Laboratory devised the apparatus shown in Figs. 85 and 86. The life belt was wrapped around a 5-gallon container and partially inflated. The container was perforated but was weighted down and was attached by means of cords and a series of pulleys to a cam drive which would alternately raise and lower the belt in and out of the water. Since, under conditions of a sinking vessel, the water would always be covered with a layer of gasoline and fuel oil, such a layer of gasoline was duplicated in the test. Since the personnel in the water would bob up and down, the action of the dual tube belt was made to simulate as closely as possible the action of personnel in the water. As a result of this test, the quality of the dual tube life preserver, and particularly the ability of the seams to stand up under severe conditions, was improved very materially. The test became a requirement of Bureau of Ships Specification 23P13 (INT), under which hundreds of thousands of belts were procured.

(To Be Continued)

Operation Recording Attachment

An operation recording attachment, as an auxiliary rectangular case instruments unit for recording and controlling pressure and temperature in rubber curing and plastic molding, has been introduced by the Brown Instrument Co., Philadelphia, Penn. The auxiliary operations pen unit is simple in design and operation. The actuating element is a bimetallic strip through which a 1½ volt current passes whenever the power circuit to the pump, compressor or other item of process equipment concerned is energized. The resistance of the bimetal to the passage of a current of 3½ amperes maximum causes it to heat and consequently to warp. The warping or bending action moves the free edge of the bimetallic strip and this movement, in turn, is transferred mechanically to a pen. Because of this action, the unit sometimes is referred to as a warp switch.

About 10 seconds are required from the instant the warp switch is energized until the pen is in the proper recording position. Within a period of 30 seconds after deenergizing, the pen returns to the outer edge of the chart. This smooth, unaccelerated action of the pen is to be contrasted with solenoids and other fast operating devices which tend toward snap action and ink splashing. There are no contacts to chatter or stick, nor is there a resistance winding around the bimetal which would require heating and cooling for each operation record, tending to slow up the switch action.

VW-1 Pressure Vane-Type Pump

Eastern Engineering Co., New Haven, Conn., has introduced a new positive pressure vane-type pump, designed for handling non-lubricating liquids such as water. Incorporated in the pump, known as the VW-1, are two composition bearings requiring no lubrication beyond that furnished by the liquid being pumped. The vanes are made of the same material as the bearing. By means of a special design of the vanes and by applying the proper radii on the vane edges, the vanes are held in contact with the pump chamber. No centrifugal force, consequently, is required to maintain volumetric efficiency.

The pump is specifically designed for use in systems having a relief valve and therefore has no bypass valve built into the pump design. Shaft sealing is accomplished by means of a mechanical rotary seal. Delivery approximates one-half gallon per minute. The pump is suitable for operating pressure of from zero to 30 pounds per square inch and is self-priming. The Universal motor is 1/15 h.p. and is available in either 110 volts or 220 volts, A.C. or D.C.

A remote control unit, called **"Flectrol,"** has been developed by Yardeny Laboratories, Inc., 105 Chambers St., New York 7, N. Y., for manufacturers and users of speed changing equipment. It can also be built in or added to all equipment having motor-operated adjustment.

Editorials . . . . . .

Case for Reclaimed Rubber

THE several reports of the Inter-Agency Policy Committee on Rubber, which contain the basis for the future national rubber policy to be adopted by the United States, represent months of labor and effort on the part of the numerous representatives making up the committee. The reports carefully and completely trace the activities of rubber procurement during the wartime period, naturally emphasizing the role of synthetic rubber. To anyone familiar with governmental and industrial activities during this period, it may seem strangely odd that so little mention is made of the past, present or future of reclaimed rubber.

To refresh the memory, one need only recall that during the period when natural rubber imports dwindled to a trickle and before large scale production of synthetic rubber began, the rubber reclaiming industry was the only major source of vitally needed rubber hydrocarbon. The Baruch Rubber Committee took full cognizance of the importance of reclaimed rubber in its over-all report on the rubber situation. What is not too well known is the fact that the reclaimers achieved one of the major recommendations in the Baruch Report by increasing reclaiming capacity by fully 20%, production jumping from 274,202 tons in 1941 to 303,991 in 1943. Furthermore, this increase was accomplished entirely without governmental financial assistance.

Reclaimers, today, face a peculiar situation, which is tied in with the synthetic rubber picture. There is little doubt that a minimum production of 250,000 tons of synthetic rubber will be maintained as a national security measure for many long years to come. It seems equally evident at the moment that continued government regulation to guarantee the consumption of this amount of synthetic annually will be maintained. Also, since there would be considerable objection on the part of rubber manufacturers to pay too high a price for synthetic rubber once natural rubber drops sharply in price, a subsidy arrangement will be provided for the synthetic. Although reclaimed rubber has sufficient merit to warrant its use even when the price of natural rubber is ridiculously low, as production and consumption figures of the past will verify, a permanent subsidy on synthetic rubber, and/or its enforced use, might create an economic situation that would be ruinous to the reclaiming industry.

The rubber reclaiming industry in this country merits better treatment. More thought should be given to the position it can occupy in the future during the present discussions of natural versus synthetic rubber. The forthcoming national rubber policy should provide suitable protection for the required synthetic rubber capacity without penalty to the reclaiming industry.

Perplexing Problems

ANNOUNCEMENT by the Combined Rubber Committee of its liquidation by the end of the current year, which in turn means the end of international allocations of rubber, brings to the fore the need for an early, if not immediate, national rubber policy. The end of such allocations, dictated by the increasingly large amounts of natural rubber in the Far East, will give rise to a number of problems for both the American rubber manufacturing industry and the United States Government that require an early solution, including the importation of the natural product, the continued operation of synthetic rubber capacity, and control over the end-use of the rubber. Closely related to all of these problems, is the problem of price.

The problem of price is the one which is likely to prove the most perplexing. If all controls are removed, the probability exists that the aggregate supply of rubber sometime during 1947 would become large enough to require a substantial reduction in the price of the synthetic product to retain a market for it. This would precipitate the whole issue of future protection for synthetic rubber, probably via subsidies. Since prolonged subsidy protection is not desirable some other method must be found. End-use control could accomplish the purpose, but again such procedure is not too desirable. A combination of both methods is recommended by the Inter-Agency Policy Committee on Rubber. No matter which policy is adopted, it seems obvious that current events call for prompt decisions.

CURRENT NEWS OF THE MONTH

NEW AGREEMENTS ON NATURAL RUBBER WILL PROVIDE U. S. WITH ANOTHER 210,000 TONS

ON September 25, the Reconstruction Finance Corporation announced conclusion of an agreement with the Netherlands Government providing for additional shipments of natural rubber from Dutch sources of at least 10,000 tons at 20¼c per pound delivered f.o.b. ocean-going steamer at Far Eastern ports. This agreement, which provides for delivery of at least 10,000 tons of natural rubber before the end of the current year, is in addition to that covered by the agreement of June 21 with the Dutch under which 25,000 tons were to be shipped from Dutch sources at an f.o.b. price of 23½c per pound. On October 1, RFC announced conclusion of Anglo-American conferences resulting in an agreement under which the United States will purchase an additional 200,000 tons of natural rubber from British sources before the end of the year at the same 20¼c per pound figure. In the latter agreement, it was specified that if the additional 200,000 tons may not become available by the end of the year from Malayan sources, shipments would be made from stockpiles in the United Kingdom at 22¼c per pound. The latter price, however, covers rubber delivered at United States East Coast ports, making it equivalent to the Malayan price. The prices relate to standard sheets and the transaction covers only rubber allocated to the United States by the Combined Rubber Committee from British sources. All purchases under the new British and Dutch agreements will be handled by the Rubber Development Corporation.

Reports from both Malaya and the United Kingdom in the past few months indicated that agreements for the purchase of additional rubber tonnage over and above those calling for the delivery of 145,000 tons of natural rubber to the United States in the July 1-December 31, 1946 period were inevitable. These reports covered sudden increases in stocks of natural rubber both in Malaya and in London warehouses. The six-month agreements called for a price of 23½c per pound f.o.b. Far Eastern ports, with 90,000 tons to come from British sources, 25,000 from Dutch, and 25,000 from French.

Background of Agreements

As soon as it became evident that Malaya would be able to ship far in excess of amounts allocated to various countries, British producers began urging their government to take action. As a result, a small group of officials and representatives of the Rubber Growers Association arrived in Washington in mid-September for discussions with American authorities.

This group included R. D. Fennelly, Under-Secretary of the Raw Materials Department of the British Board of Trade; Sir Gerard Clauson, Assistant Under-Secretary of State of the Colonial Office; R. L. Hall, of the Board of Trade, and F. D. Ascoli, Chairman of the Rubber Growers Association. Sir Oliver Goonetilleke, Financial Secretary of the Ceylon Government, also participated in the discussions.

The subsequent discussions resulted in the new agreement for 200,000 additional tons of rubber from the British. In terms of tonnage, the new agreements guarantee that over 500,000 tons of natural rubber will be received in the United States during the current year.

Announcement of the new agreements with the British and the Dutch were received favorably in the United States, particularly by the rubber manufacturing industry. Although rubber manufacturers do not look forward to the early suspension of controls and regulations over their manufacturing activities, the availability of increased supplies of natural rubber means that controls will be modified very shortly to permit additional percentages of natural rubber in some products and the free use of such rubber in others. Increased supplies at this time also means that rubber manufacturers do not have to curtail production plans, which was contemplated in some quarters due to the current shortage of GR-S.

On the other hand, the announcement drew mixed comment from financial circles in London with some authorities predicting that the new agreements would keep rubber off the free market until at least 1947. The *Financial Times* caustically described the new agreement with the British as "a reasonably satisfactory solution to a problem which need never have arisen." It charged the British Government with creating a "muddle" of over-stockpiling in Malaya by reason of faulty estimates. Rubber growers in Malaya, however, are reported to be pleased with the new agreement since stagnation of the rubber market in recent weeks had caused considerable uneasiness.

To Terminate Rubber Committee

In view of the increased quantities of natural rubber becoming available and in view of the fact that it had already recommended allocations of natural rubber for the fourth quarter of the current year, member governments of the Combined Rubber Committee have agreed that international allocation control need not continue beyond the end of this year. Accordingly, it was announced on October 10 that the Combined Rubber Committee will be terminated as of December 31, 1946.

The Combined Rubber Committee was formed following the termination of the Combined Raw Materials Board at the end of 1945. Its function was to continue the allocation of the world supply of natural rubber as long as such allocation seemed necessary. Member countries of the Committee included the United States, the United Kingdom, the Netherlands, France, Belgium and Canada.

It was emphasized, however, that the lifting of international allocation control does not necessarily entail the ending of domestic controls for natural rubber in the United States. Rubber Order R-1 is still very much in effect and the price of natural rubber sold to American rubber manufacturers remains at 22½c per pound. Until these remaining domestic price and use restrictions are suspended or dropped can a free market for natural rubber be restored in this country.

There is some talk, however, of the probability that government control over the sale and distribution of natural rubber in the United States may be lifted by the end of the first quarter of 1947. There is also some talk that the rubber industry will be allowed to purchase its own rubber in the first quarter of next year for delivery in the second quarter. Rubber for use in the first quarter of the year will probably come from the 210,000 tons provided by the new British and Dutch agreements.

In London, however, plans for reopening the Mincing Lane rubber market, once the world's biggest free market in rubber, were reported proceeding rapidly in the wake of the announcement that

international allocation controls will end by December 31. Plans now being negotiated between the Rubber Trade Association and the British Board of Trade to reestablish a free market are reported to cover spot sales only, thus eliminating speculation for the time being. If such plans are carried through, it would represent a compromise between a completely free market and complete government control.

Changes in the Rubber Order

Additional changes in Rubber Order R-1 were announced by the CPA Rubber Bureau on September 20. The changes, covered by Amendment No. 1 to Rubber Order R-1, as Amended August 21, 1946, and Amendment No. 2 to Appendix II, as amended August 15, 1946, of Rubber Order R-1, added most of the smaller sizes of truck tire tubes to the types which may be made only from natural rubber. This change was made in order to channel the short supply of butyl rubber into the production of passenger car tire tubes.

Hereafter the use of natural rubber is mandatory in the manufacture of all truck tire tubes having a cross section of 7:00 inches and up. Previously the use of butyl was required in the manufacture of truck tubes with a cross section of less than 8:25 inches. Its use is optional in making certain sizes of tubes for tractors, implements, etc. Passenger car tubes still may not be made of natural rubber.

Under the new amendments, certain special types of truck tires, such as "store door delivery" and "stop-start" types, heretofore prohibited, may now be manufactured. Other changes made by the amendments include:

Allocation of natural rubber was placed on a quarterly basis to correspond with issuance of authority to acquire GR-S as an aid to manufacturers in scheduling production.

Use of more natural rubber was authorized for making tire flaps and full circular curing tubes and provision was made for the purpose and consumption of chlorinated natural rubber without CPA authority, provided it is used only for permitted purposes. Chlorinated rubber and other privately produced synthetic rubbers which may be purchased without CPA authorization, remain subject to inventory restrictions.

All types of tires for trucks, having a cross section of 8:25 inches and up, may now be manufactured with 94 per cent natural rubber. Previously the types of tires which could be made with this percentage of rubber were specified in the order.

Tire flaps of 12-inch cross section and over may now be made of natural rubber; those with 11-inch cross section and smaller with 50 per cent natural rubber. Previously, natural rubber used in making any size of tire flaps was limited to splicing cement and identification inks. Full circular curing tubes may now be made entirely of natural rubber. Previously, all except a few types were limited to four per cent natural rubber.

GR-S may now be used without limit for experimental purposes but experimental products cannot be offered for sale. Butyl may be consumed experimentally up to 200 pounds a month per user, but no natural rubber latex or chlorinated natural rubber may be consumed for experimental purposes except on specific authorization by CPA.

Specific Standards on Tires

According to new regulations issued by the Office of Price Administration, which became effective September 11, specific standards must now be complied with to qualify factory seconds, factory rejects, and scrap tires for the ceiling prices established on these three types of irregular new tires. Designed to eliminate confusion and prevent upgrading in these tires, each of which has a different ceiling price, the action was covered in Amendment No. 10 to R.M.P.R. 528 (Tires and Tubes), Amendment No. 14 to R.M.P.R. 143 (Wholesale Prices of Tires and Tubes), and Amendment No. 16 to R.P.S. 87 (Scrap Rubber).

Sales by both manufacturers and dealers are subject to the new specifications. Heretofore, manufacturers observed various standards in branding tires as factory rejects or factory seconds as well as in destroying their worst tires so they could be sold as scrap. Dealers have followed the manufacturer's branding in determining these categories.

The new definitions, which are based on general industry practices, and have been discussed with representative manufacturers, follow:

Factory Seconds: A new tire which has surface blemishes such as surface sidewall cracks which do not extend to the cord body and which have been removed by buffing or spot repairing, tread design defects, missing letters, or other such irregularities which do not interfere with the use of the tire on the wheel of a vehicle and which, without further repair, will render substantially the same service as a new first.

Factory Rejects: A new tire having pinched beads (beads being more than two-thirds of intended width), small ply or tread separation, fabric extending beyond toe of bead, slight band ply irregularities, foreign matter cured into carcass, or other such minor defects which can be satisfactorily repaired for use on the wheels of a vehicle.

New Scrap Tires: A new tire having badly buckled plies due to creased airbags, plies omitted, plies trimmed at bead toe due to excessive pinch at bead, beads two-thirds or less of the intended width, broken wires, more than one ply of tire soft or spongy, open cords due to leaky airbags, or other such defects which render the tire unfit for use on the wheel of a vehicle.

Rayon Quota for Canada

On September 12 the Civilian Production Administration announced that an export quota for the third quarter of the current year of 745,000 pounds of high-tenacity rayon has been established for Canada. At the same time it issued Amendment No. 1 to Appendix II, as Amended August 15, 1946, of Rubber Order R-1, changing List 15 of that appendix to provide that Canadian manufacturers using tire-type high-tenacity rayon cord fabric or yarn may obtain material under the quota if their purchase orders are approved by the Canadian Rubber Controller.

The amount granted in the quota is to supplement Canadian third quarter production of approximately 1,000,000 pounds and is necessary if Canada is to fill essential replacement needs for truck, bus, and special large army tires.

Canada has not had a quota for high tenacity rayon from this country since the war ended, but a decrease of production of this type of rayon in Canada makes it advisable to reinstate the quota system.

Recent OPA Actions

Under the terms of Amendment Nos. 18 and 19 to M.P.R. 478 (Coated and Combined Fabrics), issued and effective October 2, additional increases were allowed by OPA in ceiling prices for all coated and combined fabrics, to take care of higher costs, principally for textiles. The increases at the manufacturing level are 17.5% for window shade cloth and 7.67% for all other such fabrics.

Earlier, on September 20, OPA issued Amendment No. 17 to the coated fabrics regulation broadening the definition of the term "coated fabrics" to include "artificial leather made from saturated non-woven fibrous products, and oil cloth, bookcloth, window shade cloth, tire cords, and supported or fabric-backed sheets of vinyl film made from vinyl chloride, vinyl acetate, vinyl butyral or vinylidene chloride or other vinyl resins."

A number of price suspensions of direct interest to the rubber industry have been announced by OPA in recent weeks. Amendment No. 46 to Supplementary Order 129 suspended all sales of rubber footwear by manufacturers, wholesalers and retailers from price control. Used and recapped airplane tires, and the recapping and repairing of airplane tires for all uses, were exempted from price control by Amendment No. 54 to the same order.

Amendment No. 51 to Supplementary Order 129 suspended or exempted a large number of miscellaneous items, including the following: Tire reliners made from new and scrap materials, and tire patches and boots made from scrap materials; tire valves and pneumatic oral inflated valves; gloves, finger cots, and sleeves for medical, surgical, obstetrical, autopsy and mortuary purposes; hard rubber goods for medical, surgical, veterinary, mortuary, and laboratory equipment and parts; tubing, stopples and irrigators for medical, surgical, mortuary, veterinary, and laboratory purposes; obstetricians', surgeons' and urologists' aprons; operating cushions; patients' bibs and throws; gas main bladders; shoe bladders.

HOLT REPORTS ON FINDINGS OF FAR EAST RUBBER SURVEY

Rubber production in former Japanese-occupied areas of the Far East, and in Ceylon, will probably total 600,000 long tons in 1946 and 950,000 long tons in 1947, according to E. G. Holt, Rubber Advisor to the Department of Commerce, who recently returned from a three-month trip to the Far East. Mr. Holt visited Siam, Malaya, the Netherlands Indies and Indo-China, and also gathered information on British Borneo (Sarawak, North Borneo, Brunei and Labuan) during his trip to investigate rubber production, sponsored jointly by the Department of Commerce and the Rubber Development Corp.

Uncertainties in the general economic, labor and political situations in the Far East make it difficult to forecast production accurately, Mr. Holt asserted. Potential capacity for rubber production in the area was estimated at approximately 1,650,000 long tons a year, and generally speaking a good start was said to have been made towards getting production under way.

Natives and small-holders have been particularly enterprising in this regard, the Rubber Advisor stated, and production on large estates in British Malaya has also made rapid headway. However, not much progress has been made on the rubber estates in Indo-China and British Borneo, and in the Netherlands Indies production on estates is almost negligible, being limited to those properties located in Borneo, Celebes and Riouw, the areas under Dutch control.

In the territory under nominal Indonesian jurisdiction, in Java and Sumatra, the rubber estates are now inactive with very few exceptions. This territory contributed all but a small part of the 301,000 metric tons of Dutch estate rubber exported in 1941. Before the war approximately 55% of the rubber produced in the Far Eastern areas came from estates of 100 acres and more in size, and about 40% from small-holders.

The outlook for the future is that a large share of the Far East's rubber production will come from the small-holders, Mr. Holt declared. In 1947, he estimated, small-holders will produce well over 60% of the rubber. This postwar increase in the importance of small-holders is regarded as significant in the Far East, and the British Colonial Office is now making a study of Malayan small-holders. Political considerations appear to make restrictions on native production less feasible now than in prewar years and the large estate producers therefore seem likely in the future to experience more severe competition from the native producers than before the war.

The American buying price for natural rubber in the Far East of 20¼c a pound prevailing up to June 30, 1946, did not retard the resumption of production by either estates or natives. The estates were resuming operations as a matter of policy, in many cases, without regard to immediate profits during the first half year after V-J Day, Mr. Holt said. The natives are eager to produce as much rubber as they can, because for the first time since 1941 they have a market for their product and an opportunity to earn a cash income.

The following summary of outlook for rubber production in the Far East, prepared by Mr. Holt, is based on the assumption that there will be a continued, if gradual, improvement in general economic conditions in the Far East:

ESTIMATES OF FAR EASTERN RUBBER PRODUCTION

(*In Thousands of Long Tons*)

Natives and Small-Holders

Country	Potential Capacity	Estimated Production 1946	1947
Malaya	265	175	235
Neth. E. Indies.	450	135	235
Siam	51	16	38
Br. Borneo	45	18	35
Ceylon	35	30	30
Indo-China * ...	0	0	0
Total	846	374	573

Estates Over 100 Acres

Country	Potential Capacity	Estimated Production 1946	1947
Malaya	335	145	235
Neth. E. Indies.	300	5	20
Siam	9	3	7
Br. Borneo	18	7	15
Ceylon	65	50	50
Indo-China	80	20	50
Total	807	230	377

* Native industry negligible.

Coming Events

Oct. 25-26. Society of Rheology, Annual Meeting, Hotel Pennsylvania, New York City.

Nov. 1. Chicago Rubber Group, Hotel Morrison, Chicago, Ill.

Nov. 8 Connecticut Rubber Group, Auditorium of the United Illuminating Co., 80 Temple St., New Haven, Conn.

Nov. 22. Akron Rubber Group, Hotel Mayflower, Akron, Ohio.

Dec. 2-6. American Society of Mechanical Engineers, Annual Meeting, New York City.

Dec. 6. Boston Rubber Group, Xmas Party, Boston, Mass.

Dec. 13. New York Rubber Group, Xmas Party, Hotel McAlpin, New York City.

Feb. 24-28. A.S.T.M., Spring Meeting and Committee Week, Hotel Benjamin Franklin, Philadelphia, Pa.

Apr. 14-18. A.C.S., 111th Meeting, Atlantic City, N. J.

June 16-20. A.S.T.M., Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

RUBBER CONSUMPTION IN JULY DROPS 4.7% IN UNITED STATES

Consumption of natural and synthetic rubber in the United States during the month of July amounted to 75,657 long tons, a decrease of 4.7% from the 79,365 long tons consumed during June, according to a report issued by the Rubber Manufacturers Association. The dip was largely seasonal, the Association reported, and was caused by the following factors: vacation periods curtailed production in a number of factories; other companies followed tradition and closed temporarily for inventory and maintenance work; and a strike choked off sizable production of one tire company for the month.

According to the report, the tremendous backlog of peacetime demand for all types of rubber articles had pushed consumption for the first seven months of 1946 to a record 569,675 tons, as compared with 491,928 tons consumed during the last seven full months of war production, from January 1 through July 31, 1945.

The total consumption of natural rubber for the first seven months of the year was 106,582 tons, an increase of 53.8% above the 69,272 tons used during the same period of 1945. A 9.6% increase was noted in the consumption of synthetic rubber with 463,093 tons consumed during the first seven months of 1946 as compared with a total of 422,656 tons used during that period of 1945. Reclaimed rubber consumption rose 6.32%, with 152,000 tons total through July, 1946, against 142,970 tons consumed during the corresponding period of the previous year.

Synthetic rubber was consumed during the first seven months of 1946 in the following proportions: 389,404 tons of GR-S; 23,263 tons of neoprene; 47,496 tons of Butyl; and 2,930 tons of nitrile rubbers.

Outcault Contacts Local Groups

Harry E. Outcault, assistant sales manager, zinc oxide department, St. Joseph Lead Co., New York City, was recently elected vice-chairman of the Rubber Division, A.C.S., as reported elsewhere in this issue. One of the duties of the vice-chairman is to act as liaison officer between the Division and the sponsored local rubber groups. In this connection Mr. Outcault recently sent the first of a planned series of letters to the secretaries of all such groups. In his letter, he urged all group secretaries to keep him advised of developments pertaining to their respective groups, especially as regards meeting dates and programs, since it is hoped that meetings on the same dates, a problem of the past, will be avoided in the future. It is also Mr. Outcault's intention to attend at least one meeting of each group during the coming year.

BULK HANDLING OF SRF PELLETS FROM CAR TO BANBURY ACCOMPLISHED

What is reported to be the first completely satisfactory delivery of SRF pellets through bulk handling facilities to a mill room Banbury is said to have been accomplished at the plant of the Pennsylvania Rubber Co. in Jeannette, Penna., on September 4. According to P. C. Mathewson, Pennsylvania Rubber vice-president, the delivery was made "with no difficulty whatsoever." It was made possible by collaborative work between the rubber company, the Cabot Carbon Co., and the General Atlas Carbon Co., a Cabot subsidiary.

The quality of the pellets, according to Cabot, was that which is regularly available at Cabot and General Atlas plants, handled through regular plant conveying and bulk loading facilities. CABX 87, in which the black moved to Jeannette, was a car of the type that is standard in the industry and is provided with slope sheets and outlets identical to those used for the bulk movement of channel black.

The Pennsylvania Rubber receiving installation is a skillfully designed combination belt conveyor-bucket elevator system. A conveyor delivers black from the three outlets underneath the car to a short cross conveyor which carries it to the boot of an 80 foot continuous bucket elevator. The elevator delivers the black to a third belt conveyor which discharges into a bulk storage tank on the top of the building. This tank, 31 feet high and 24 feet in diameter, is partitioned for simultaneous storage of two grades of black.

Totally enclosed belt conveyors on the roof transport the material distances of from 40 feet to 60 feet from the storage tank to appropriate points above three Banburys to which delivery is made by gravity through surge tanks and weigh hoppers.

Operation Automatic and Smooth

Unloading time of the car was indefinite because of occasional stoppages to check starting loads on loaded elevator and conveying equipment, and to sample the material in the course of its journey through the system. The capacity of the installation to operate automatically and smoothly over a wide range of unloading rates was clearly demonstrated. The entire 85,000 pounds of Sterling S were delivered with nothing more than intentional interruptions.

The initiation of bulk shipment of furnace black, according to Cabot, has been delayed for three reasons: first, because it is inherently difficult to form furnace blacks into pellets of sufficient strength to withstand bulk shipment successfully. Secondly, many of the present bulk receiving installations, which are perfectly adequate for handling channel black pellets, are not well suited to the job of handling even a well constructed furnace black pellet. Thirdly, tank cars for the movement of channel black to presently installed receiving facilities have been critically short.

Wholesale movement of furnace black in bulk, and especially the provision of special bulk receiving equipment, is not feasible until additional tank cars which have long been on order are delivered. This experience then is significant only because it is a demonstration of the fact that this difficult job can and will be done "with no difficulty whatsoever."

Connecticut to Meet November 8

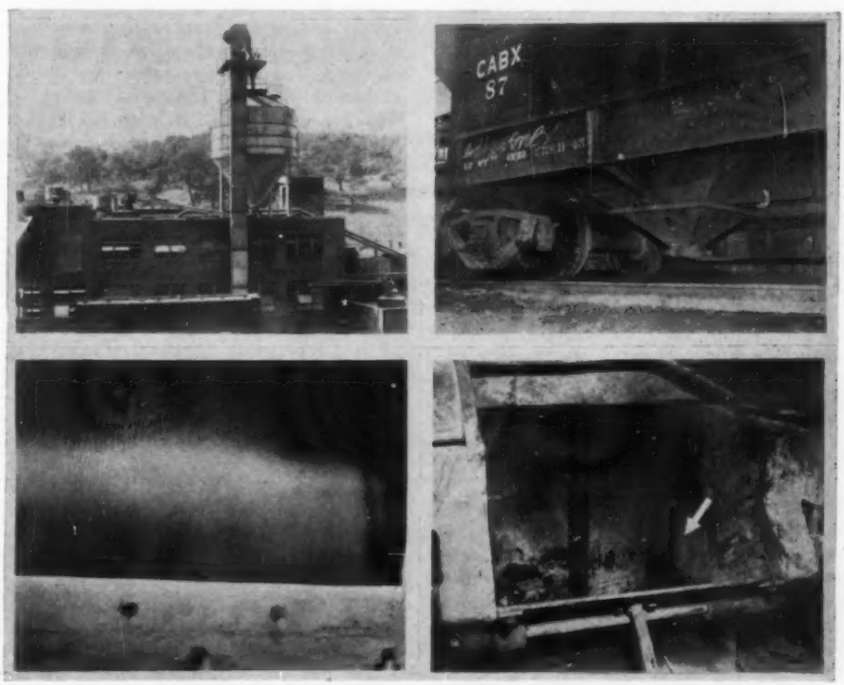
The Fall Meeting of the Connecticut Rubber Group is scheduled to be held in the Auditorium of the United Illuminating Co., 80 Temple St., New Haven, Conn., on Friday evening, November 8. Dr. A. E. Boss, manager of pigment sales of the Columbia Chemical Division of the Pittsburgh Plate Glass Co., will speak on "Experimental GR-S Polymers," while Dr. L. M. White, of the General Laboratories of the U. S. Rubber Co., will present a paper on "Laboratory Evaluation of GR-S Processing Characteristics."

New Polyvinyl Compound

A new polyvinyl compound, known as Texflex, which is expected to impart longer life to plasticized materials, has been developed by the H. V. Walker Co., Elizabeth, N. J. According to the company, experiments conducted with the assistance of textile manufacturers have indicated that Texflex has exceptionally good heat and light stability and is completely unaffected by aging. The new material is said to be adaptable to use on any woven fabric and to use in coating leather and other smooth finish flexible materials. It may be applied by dipping, roller-coating, knife-coating, brushing or spraying. Its minimum tendency to string or cobweb is reported to make it possible to obtain a relatively uniform surface with any method of application.

Research Center Being Built

B. F. Goodrich Co. has announced that construction work is continuing on its new research center located in Brecksville, Ohio, midway between Akron and Cleveland. A booklet which describes the lobby, conference room, laboratory units, and library of the new center has been made available by the company.



UPPER LEFT: General view of the Pennsylvania Rubber plant with car about to be unloaded. The vertical bucket system for movement of the black to storage on the roof is shown (center) while the belt system conveying the black to the weigh hopper is seen at the right. UPPER RIGHT: As the black left the car, the hopper trap was opened and the black dropped into a bin below the tracks where it was picked up on a belt conveyor. LOWER LEFT: Slow motion picture of the pellets as they flow from the belt system on the roof into the chute which carried them into the weigh hoppers. LOWER RIGHT: Completion of the trip, with the black flowing direct into the Banbury. It can be seen pouring in, as indicated by the arrow, through the vent on the right.

RUBBER DIVISION, A.C.S., HOLDS SATISFACTORY MEETING AT CHICAGO

The Fall Meeting of the Division of Rubber Chemistry of the American Chemical Society, held at the Hotel Sherman in Chicago, Ill., on September 11, 12 and 13, in conjunction with the 110th Meeting of the parent society, was deemed satisfactory in most respects by those attending. A registration of approximately 9,000 was recorded for the over-all society, a total exceeded on only one occasion, when an attendance of almost 10,000 was registered at the meeting held in New York City in 1944, while registration for the Division alone was estimated at approximately 800.

The meeting of the Division featured the presentation of 34 technical papers (abstracts of which appeared in our August, 1946, issue), including the Charles Goodyear Lecture by Ira Williams, director of research of J. M. Huber, Inc.; introduction of newly-elected officers, selected by letter ballot, the ballots being counted during the meeting; a short business session, and the usual banquet. A Rubber Group Luncheon, attended by chairmen and secretaries of the various local rubber groups, with the Division as host, was also held.

The letter ballot resulted in the election of the following officers of the Division for the 1946-47 season: *Chairman,* Walter W. Vogt, of the Goodyear Tire & Rubber Co., Akron; *Vice-Chairman,* Harry E. Outcault, of the St. Joseph Lead Co., New York; *Secretary,* Charles R. Haynes, of the Binney & Smith Co., New York; *Treasurer,* C. W. Christensen, of the Monsanto Chemical Co., Akron; *Sergeant-at-Arms,* L. M. Baker, of the Mansfield Tire & Rubber Co., Mansfield, Ohio. The following new directors were also elected for one-year terms in accordance with the new by-laws: G. L. Allison (Goodrich), Gilbert Swart (General Tire), and A. M. Neal (DuPont). C. A. Bartle (DuPont) was chairman of the Tellers Committee. (EDITOR'S NOTE: Biographies of some of the new officers will appear in our next issue).

Dr. Gibbons Opens Meeting

In opening the meeting on September 11, Dr. W. A. Gibbons (U. S. Rubber), the retiring chairman, briefly discussed developments in the natural and synthetic rubber fields, and reiterated his previously expressed opinion that synthetic rubber is here to stay for all time. He also referred to the fact that the activities of the Rubber Division were constantly expanding to cover the entire field of "rubber science."

At a short business session, held on the afternoon of September 12, the results of the letter ballot resulting in the selection of new officers were given. Harry E. Outcault (St. Joseph Lead), as chairman of the Membership Committee, reported that the Division had acquired 80 new members since the previous report, there now being 1,351 active and 267 associate members, for a grand total of 1,618. In announcing the retirement of Dr. H. I. Cramer (Sharples Chemicals) from the position of secretary which he had held since 1937, Dr. Gibbons expressed appreciation for his work on the part of the Division. Dr. Cramer was given a rising vote of thanks.

The banquet was held in the Grand Ballroom of the Hotel Sherman on Thursday evening, September 12. In addition to an excellent dinner, one of the best entertainment programs witnessed at Division banquets was presented, consisting of a number of novelty vaudeville acts. The program was built around the theme "A Night at the Circus," and starred Jimmy Costello, comedy star of the radio program "Let's Have Fun." Special credit for the excellence of the banquet and the entertainment is due to Francis S. Frost (Frost Rubber Works) and James Sheridan (N. J. Zinc).

Williams on Vulcanization

Presentation of the Charles Goodyear Lecture by Ira Williams on the morning of September 12 attracted an audience of approximately 1,000. Dr. Williams selected as his subject, "The Vulcanization of Rubber With Sulfur." An abstract of the lecture follows:

The vulcanization of rubber with sulfur is a chemical process in so far as it depends on the chemical combination of the sulfur but the manner of combination of sulfur is not known definitely. The reaction of sulfur with the rubber is maintained at a constant rate due to the activating effect of sulfur already combined which aids the attack of sulfur on methylene carbon atoms. Such attack is probably destructive to the rubber.

The rubber molecule, in itself, differs in the sequence of methyl groups and double bonds, depending on the direction of passing along the carbon chain. It is suggested that equal numbers of chains run in each direction and that natural rubber is formed under such conditions that the opposed double bonds in adjacent molecules are paired. This pairing of double bonds is responsible for stability and loss of double bond characteristics by the rubber. Oxygen will not attack rubber until this pairing is disturbed.

Various types of resonance can contribute to the ability of electrophilic materials, such as sulfur, to attack the rubber. Resonance within the double bond which may be responsible for the association of unvulcanized rubber is probably of little importance in directing the attack by sulfur. The resonance due to hyperconjugation between the methyl group and the double bond can occur in natural rubber but in none of the butadiene synthetics. This type of resonance while being harder to initiate can be more completely developed than resonance to activate methylene carbon atoms and will promote the attack by sulfur on the doubly bonded carbon atom not attached to the methyl group.

This resonance effect is promoted by nucleophilic substances such as the known accelerators and is retarded by electrophilic substances such as strong acids. The thioketone which would result would form a more permanent dipole and promote stronger association either through electrostatic forces or through hydrogen bonding.

The strong association between sulfurized rubber molecules can be reduced by nucleophilic substances such as piperidine and the vulcanized rubber can be brought into a relatively non-viscous solution. Removal of the peptizing agent and solvent results in reassociation of the rubber and redevelopment of insoluble vulcanized rubber.

The function of soluble zinc salts has not as yet been determined. Werner type complexes formed between accelerators and zinc could tend to regulate the nucleophilic properties of the accelerator within a more effective range.

The study of vulcanization should be encouraged particularly because of its importance to the synthetic rubber industry. The natural rubber industry developed as an art largely because of the adaptability of the natural product. Most synthetic rubbers, other than chloroprene polymers, refuse to vulcanize satisfactorily in the absence of large amounts of powders. Perhaps the present synthetics will be vulcanized satisfactorily in the future. It is certain that a better understanding of the process by which natural rubber is vulcanized would assist in finding better methods of vulcanizing synthetics and in formulating synthetics which are more vulcanizable—End of Abstract.

Hold High Polymer Forum

The High Polymer Forum, which was introduced and proved so popular at the Atlantic City Meeting, was again held at Chicago. Held on September 10 and 11, the Forum featured the presentation of 25 papers, a number of them being of especial interest to rubber chemists and technologists, including the following:

Further Relations Concerning the Mechanism of Emulsion Polymerization, by William D. Harkins (University of Chicago); *Initiation and Growth of Butadiene Resinous Polymers,* by L. M. Welch, M. W. Swaney, R. F. Howe, A. H. Gleason, and R. K. Beckwith (Standard Oil Development Co.); *A Study of Reactions of Buna Rubbers with Aliphatic Mercaptans,* by G. E. Serniuk, F. W. Banes, and M. W. Swaney (Standard Oil Development Co.); *Regulator Theory in Emulsion Polymerization,* by W. V. Smith (U. S. Rubber Co.); *Emulsion Copolymerization of Isoprene and Styrene,* by A. J. Johanson and L. A. Goldblatt (Department of Agriculture).

Also, *Sorption of Water Vapor by High Polymers,* by Sherman E. Smith; *Permeation Through and Sorption of*

Water Vapor by High Polymers, by P. M. Hauser and A. D. McLaren; *Polythene Fine Structure,* by W. M. D. Bryant; *Solubility of Low Polymers of Styrene,* by Paul O. Powers (Battelle Memorial Institute); *Heats of Combustion and Solution of Liquid Styrene and Solid Polystyrene and the Heat of Polymerization of Styrene,* by Donald E. Roberts, Wm. W. Walton, and Ralph S. Jessup (Bureau of Standards); *Spectrophotometric-Interferometric Particle Size Determinations in Synthetic Latices and Bearing of the Results on the Theory of Emulsion Polymerization,* by W. Heller (Wayne University) and Howard B. Klevens (University of Chicago).

In addition to the foregoing, three papers on synthetic latices were presented on the morning of September 11 during the Symposium on the Stability of Colloidal Dispersions sponsored by the Division of Colloid Chemistry. Titles, authors and abstracts of these three papers follow:

Coagulation and Stabilization of Synthetic Latex. By W. Heller (Wayne University) and Hans Oppenheimer (University of Chicago): Synthetic latex prepared by the emulsion polymerization of styrene and isoprene was coagulated with various organic salts. The polymer particles being ordinarily negatively charged, the cations acted as counterions. Their coagulating power was found to obey the rule of Schultze and Hardy, which was tested for Na^{+}, Mg^{++}, Al^{+++}, Th^{++++}. The latter two cations gave rise to irregular series with a wide second zone of stability. It was thus possible to prepare latices with positively charged polymer particles and to use them for coagulation of ordinary synthetic latex.

A series of measurements was carried out on the variation of c_e/c_p with polymer concentration, c_p; c_e being the electrolyte concentration necessary in order to completely coagulate, within a fixed period of time, latex with negatively charged particles. This ratio was found to decrease generally with increasing c_p. For NaCl as the coagulant, the decrease was particularly simple and followed a linear relationship.

Since soaps were the main stabilizing factor in the latices studied, the desorption of the stabilizing electrolyte during coagulation could be followed easily by measurements of the surface tension. By raising the soap concentration, the stability of latex could be enhanced considerably, both towards coagulation by counterions and coagulation by freezing. Salts wtih polyvalent anions were found to be equally effective as protective agents.

The Stability of Elastomer Latices at Low Temperature. Low Temperature Thickening of Neoprene Latex. By H. K. Livingston (DuPont Jackson Laboratory): Certain types of neoprene latex undergo a marked increase in viscosity and yield point on cooling to 0° to 10° C. The change is abrupt and resembles in some respects a phase transition (sol → gel). Although this change on cooling might be considered an evidence of instability, the latex regains its normal properties on warming. Latex can be held at 0° to 10° C. for long periods without coagulation.

The temperature of paste formation can be determined accurately by a modification of the pour point test used for lubricating oils. Shear stress-shear rate curves have been used to determine the flow characteristics of thickened latex.

Increasing the concentration of either alkali or emulsifying agent increases the temperature of paste formation. Small amounts of non-ionic emulsifying agents (such as nonaethylene glycol monolaurate) lower the temperature of paste formation.

Certain analogies to the behavior of soaps are pointed out and a theoretical explanation of the thickening process is suggested.

The Stability of Elastomer Latices at Low Temperature. Coagulation of Synthetic Rubber Latices by Freezing. By H. W. Walker (Du Pont Jackson Laboratory): A simple technique is described for determining the coagulation by freezing characteristics of small amounts of polymer dispersions in thin films under controlled conditions. Whereas films of natural rubber latex are less than 50% coagulated after 9 days at —65° C., most butadiene and chloroprene latices coagulate completely within 60 seconds at —15° to —30° C.

The instability of synthetic rubber dispersions at subzero temperatures makes operable an efficient, continuous process for isolating dry polymer by means of coagulation by freezing.

The time required for coagulation by freezing of a polychloroprene dispersion varies with the temperature of the frozen film, the nature of the stabilizing agent and polymerization regulator present, and the pH of the dispersion, but it is independent, over the range studied, of the concentration of the stabilizing agent, the concentration and age of the latex, the amount of monomer present, and the presence of a solvent such as benzene.

It is considered that the structure of the polymer within the dispersed particles has little or no influence on the stability of the latices at subzero temperatures, but that the colloidal character and low-temperature behavior of the stabilizing agent are the chief factors which determine the redispersibility of the polymer particles on thawing of frozen films of latex.

Chemical Exposition Held

Over 40,000 visitors attended the Fourth National Chemical Exposition which was held at the Chicago Coliseum concurrently with the meeting of the American Chemical Society. Sponsored by the Society's Chicago Section, the exposition featured more than 200 industrial and commercial exhibits.

The exhibits covered a wide variety of products, including process equipment, instruments, laboratory equipment, and numerous new chemicals. Included among the new chemicals shown was Indulin, the pine wood lignin for reinforcing rubber recently introduced by the West Virginia Pulp & Paper Co., while among the process equipment was the new line of high pressure valves, fittings, pumps and reactors for laboratory and pilot plants placed on the market within recent months by the newly-organized firm of Autoclave Engineers, Inc.

Goodrich Sets Up New Division

B. F. Goodrich Co. has announced the creation of a new plastics production division, with Bert S. Taylor, formerly general superintendent of the company's processing division, as production manager. In his new post, Mr. Taylor will be in charge of the new $5,000,000 plastics processing plant the company is building near Marietta, Ohio, as well as other plastic production activities. Mr. Taylor joined Goodrich in 1925, after receiving his bachelor's degree in chemistry from the University of Illinois and his master's degree in the same subject from Harvard University. After several years in chemical research, he was named manager of the company's chemical laboratories in 1928. He held that post until 1930 when he was named manager of raw materials development. In 1938, he was appointed general superintendent of the processing division. Robert H. Wattleworth, formerly manager of the processing departments, has been named general superintendent of the processing division to succeed Mr. Taylor.

Aluminum Replaces Copper Wire

Because of the current copper shortage, the U. S. Rubber Co. has substituted aluminum for copper in some of its building wire and cable now going into production. The insulated aluminum wire will be made in all sizes, as approved by Underwriters' Laboratories. Aluminum is said to have high electrical conductivity, light weight, and adequate flexibility. The company has developed aluminum wire with the same over-all diameter as equivalent copper sizes. Since aluminum is in plentiful supply, it is expected that the company will be able to ease the wire shortage resulting from the temporary scarcity of copper and thus remove one of the obstacles to building construction.

ASTM Schedules 1947 Meetings

American Society for Testing Materials has announced the dates for its two national meetings in 1947. The Society's Spring Meeting and Committee Week is scheduled to take place at the Benjamin Franklin Hotel in Philadelphia, Pa., from February 24 to 28, while its fiftieth annual meeting is set from June 16 to 20 at Chalfonte-Haddon Hall in Atlantic City, N. J.

TENFOLD INCREASE IN VINYLS SEEN BY GOODRICH OFFICIALS

James J. Newman, vice-president of the B. F. Goodrich Co., told a group of manufacturers and processors at a Koroseal Forum on September 10 at the Waldorf-Astoria Hotel in New York City that despite a tenfold increase since 1940 in production and use of vinyl resins, there still are potential markets in coated fabrics, coated paper, film and sheeting capable of absorbing more than ten times the volume of such resins currently being produced for those uses. He emphasized that this estimate was based on a reasonable and conservative replacement of present materials with vinyl resins, plus creation of new and superior articles.

The forum was sponsored by Comprehensive Fabrics, Inc., distributor of Koroseal in the consumer goods field, and the B. F. Goodrich Co. Joseph P. Kasper, president of Associated Merchandising Corp., also addressed the meeting on "What the Retailer Expects from Plastics." About 100 Koroseal licensees and prospective licensees attended the morning and afternoon sessions, with 250 persons at the dinner meeting.

"The plastics business is by no means a side issue with our company," Mr. Newman said, "but an important and ever-growing division to which we are giving and will continue to give the full range of company support in terms of finance, technical research, merchandising, advertising, and sales promotion."

Value of Plastics Consumption

The Goodrich executive showed how the national dollar-volume consumption of all types of plastics had grown from $20,000,000 to $95,000,000 in the years 1936 through 1940 and, further stimulated by war needs, would reach $750,000,000 this year—37½ times what it was only ten years ago.

In April of this year, Mr. Newman said, the production of vinyl resins had reached an annual rate of 119,600,000 pounds—almost ten times the 12,000,000 pounds produced in 1940. He said his company's Business Research Department had surveyed potential markets for Koroseal, and in the section of its report dealing with products from coated fabrics, coated papers, film and sheeting the indicated potential market, in terms of resin content, was 400,000,000 pounds, whereas the actual use of vinyl resins in such types of merchandise was at the annual rate of 35,000,000 pounds.

His firm's faith in plastics has been amply demonstrated, Mr. Newman declared. He cited its new $5,000,000 plastics processing plant at Marietta, Ohio, and the fact that Goodrich has purchased the synthetic rubber plant it built and operated for the government at Louisville, Kentucky, and will have an investment of approximately $7,500,000 in it, mainly for production of polyvinyl chloride.

The speaker pointed out that Koroseal was by no means a war baby, but had been introduced several years before the war and had been so vigorously merchandised by Goodrich and, in the consumer goods field, by Comprehensive Fabrics, that demand had begun to far outrun supply many months before Pearl Harbor—after which, for the duration of the war, the material went to military uses only. The method of making end products out of polyvinyl chloride, Mr. Newman recalled, stems from the discovery in 1926 by Dr. Waldo Semon, director of pioneering research for Goodrich, of a practical way of plasticizing this material.

Analyzing general business prospects, Mr. Newman said that his company's estimates of 1947 weekly earnings and cost of living indicate that purchasing power will be substantially greater next year than it was in 1941, despite the increase in cost of living. The prospect, he indicated, is for weekly earnings 62% above the 1941 level, with cost of living 42% higher than in that year.

On the other hand, he pointed out that the time is not far distant when, in contrast to the present seller's market, production will be equal to demand and in many cases greater than demand.

In his talk, Mr. Kasper strongly emphasized the need for manufacturers of plastics products "knowing exactly what their product will and will not do," and for putting out correct and thorough information for the guidance of both the retailer and the ultimate consumer. He decried the tendency to over-use the presumed magic word "plastic" as a means of attributing glamor or super-quality to an article, and urged that promotion of such articles be on the grounds of merit.

Need Technical Personnel

Both the War Department and the Department of Commerce are currently engaged in combing German technical documents as the second phase of the work begun by the Technical Industrial Intelligence Committees. To complete this work technical men are needed in the fields of chemicals, aeronautics, automotive, machine tools, general industrial equipment, fuels and lubricants, metals and minerals, communications equipment, scientific instruments, shipbuilding and textiles. A knowledge of German is essential. Appointments are subject to Civil Service approval and are made for a minimum of six months. Individuals with the necessary background and requirements for this work are urged to communicate for further information with the Office of the Publication Board, Department of Commerce, Washington, D. C.

An index to Vol. 59 of RUBBER AGE will be found on Pages 123 to 126 of this issue.

PLANTATION REHABILITATION UNDERWAY BY U. S. RUBBER CO.

U. S. Rubber Co. has announced that its Malayan plantations are being rehabilitated at a cost of $3,000,000, and that production during the fourth quarter of this year is expected to total approximately 6,000,000 pounds. This rubber is being produced at high cost and with improvised equipment.

As rehabilitation progresses, the company intends to convert its plantations to the production of latex. However, it has been indicated that no latex will be available for shipment for some time, due to the destruction of all former latex facilities during the war and the difficulty of procuring necessary equipment under present conditions. The company plans to complete 60% of its rehabilitation work in 1947, and 100% of it by the end of 1948.

The Malayan properties of U. S. Rubber now contain 27,261 planted acres, 1,914 acres having been destroyed during the war. The remaining acreage will have a potential yield of 900 pounds an acre, or double the yield of the average Malayan estate before the Japanese occupation. The increase will result from scientific methods of selection, bud grafting and manuring. The 1,914 acres destroyed during the war will not be replanted at present.

Chief cost items of rehabilitation are reported to be as follows: $1,085,000 for field restoration, including cleaning out undergrowth, thinning of replanted areas, manuring, and repairs and replacement of roads, bridges, and drains; $209,000 to reestablish buildings and equipment for production of smoked sheet; $638,000 to reestablish buildings and equipment for production of latex; $1,068,000 for other buildings and facilities, such as offices, dormitories, garages, and power.

Reemploys Over 1000 Veterans

Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., Passaic, N. J., which had a total of 1,625 of its 4,000 employees in the Armed Forces during World War II, has announced that it has reemployed 1,049 of them. Fifty-nine employees made the supreme sacrifice. The company also has reported that of the total number of veterans reemployed not one case was submitted to the Veterans Administration.

Establishes Boston Office

B. F. Goodrich Chemical Co. has established a new sales office in the United Shoe Machinery Company Building, 140 Federal St., Boston, Mass. W. D. Lahey and J. J. Breen have been named sales representatives for Geon thermoplastics in the Boston and New England areas. Their headquarters previously had been in New York City.

CUSTODIAN PROHIBITS TRANSFER OF STOCK TO KEY CORPORATIONS

James E. Markham, Alien Property Custodian, has issued a general order prohibiting any interest in stock in designated key corporations, seized by the Office of Alien Property Custodian, from being transferred to or acquired by any person not an American national. In issuing the order, Mr. Markham explained that in many instances shares of stock in domestic corporations seized by the Alien Property Custodian during the first World War, and subsequently sold by him to Americans, were found at the time of World War II to have again come under enemy ownership and control as the result of intermediate sales or transfers.

The regulation, APC General Order No. 35, provides that certain business enterprises in which stock is held by the Alien Property Custodian and which are vital to the defense economy of the United States will be designated "key corporations" and restrictions will be placed on the resale of the vested shares.

At the same time, Mr. Markham issued Order No. 1 under General Order No. 35, designating the American Bosch Corp., Springfield, Mass., as a key corporation within the meaning of the order. In general terms, the order defines "American national" as the United States or any subdivision or agency thereof, any individual who is a citizen of and a resident in the United States, and/or any partnership or corporation having its principal place of business in the United States provided that 75% interest in the organization is owned by American citizens who are residents in the United States.

Mr. Markham explained that every key corporation, when so directed by the Alien Property Custodian, will stamp or print on all certificates hereafter issued representing shares of vested stock a statement of the prohibitions and restrictions on the sale or transfer of stock. Under the order, each key corporation is required to furnish the Alien Property Custodian periodic lists of the names and addresses of the holders on record of the stock vested and sold by the Custodian.

American Bosch Corp. is said to be the only firm designated a key corporation in the order because it is expected that the company will be offered at public sale some time this fall.

Buys Dispersions Process, Inc.

Acquisition of the outstanding common stock of Dispersions Process, Inc., has been announced by the U. S. Rubber Co. The activities of the subsidiary, which consist of the development and sale of rubber dispersions, reclaimed rubber, plastics and other rubber-like materials, will be combined with the latex activities of the Naugatuck Chemical Division of U. S. Rubber. Sales headquarters for dispersions and latex will be located at the Naugatuck, Conn., plants.

Vila Named Sales Manager

George R. Vila

George R. Vila, formerly assistant development manager of the Naugatuck Chemical Division of the U. S. Rubber Co., has been appointed sales manager for latex, Lotol, rubber dispersions and plastic products. Mr. Vila will make his headquarters at the Naugatuck Chemical plant in Naugtauck, Conn., and will also maintain an office at the company's general offices at 1230 Avenue of the Americas, New York 20, N. Y. Mr. Vila joined Naugatuck Chemical in 1936 as a technical sales representative specializing in rubber chemicals. In 1942, he was transferred for work in synthetic rubber research and in 1943 became technical coordinator for the company's synthetic rubber division in charge of research, development and quality control. In late 1945, he went to Germany to investigate German research and production methods in the synthetic rubber field as a member of a research group sponsored by the Office of Rubber Reserve and composed of representatives from the four largest companies. He became assistant development manager for the company's chemical and synthetic rubber divisions in January of this year.

To Increase Silicone Output

Reduced costs and a consequent broadening of uses for silicone products is expected to be effected gradually when production is started sometime in 1947 in the Waterford, N. Y., factory of General Electric Co., now under construction. At present, General Electric is producing silicones only on a pilot plant basis, but tremendous interest is said to have been shown in the products by manufacturers in a great number of industries. The products which the company plans to produce at the Waterford plant include raw material for silicone rubber, silicone oils, greases, and resins, and Dri-Film water repellent material.

GERMAN INSTRUMENT INDUSTRY COVERED IN COMMERCE REPORT

German use of automatic controls for measuring temperature, pressure, humidity, and other factors is about ten to fifteen years behind current practice in the United States, according to a report released recently by the Department of Commerce. The report was prepared by four American experts who investigated the German industrial equipment industry under the auspices of the Technical Industrial Intelligence Division of the Office of Technical Services of the Department of Commerce. Development of industrial instruments in Germany is about five to ten years behind the American industry, in the investigators' opinion.

The wartime role of industrial instruments in Germany was small as compared with that in America, the investigators point out. Apparently enough low-cost labor was available to permit hand operation for most industrial measuring purposes. Also, large scale use of the batch method of processing in Germany permits greater dependence upon hand controls than does the continuous method used in the United States.

Largely because of the strong influence exercised by the I. G. Farbenindustrie cartel system, the German industrial instrument industry lacked control not only over the materials used, but also over the manufactured product, according to the investigators. In many cases, equipment could not be designed to fit a particular job because the processing plants were so closely restricted to protect trade secrets that instrument manufacturers were not allowed to send technicians into them to study their special methods. Workmanship was also found to be of poor quality. Materials and components of identical quality generally were not obtainable.

The only new material found in use by the German industrial instrument industry was polyvinyl thermoplastic, manufactured by I. G. Farbenindustrie under the trade name "Igelit." The material was fabricated on a large scale into vessels, pipes, fittings, cases and other items. By using a strip of the plastic as a welding rod, the material could be welded with a hot air jet from a special torch.

Copies of the report (PB-4600) may be obtained from the Office of Technical Services, Department of Commerce, Washington 25, D. C., for $9 in photostat form and $1.50 in microfilm form.

Anchor Rubber Buys Plant

Anchor Rubber Products Co. has purchased a plant near its present factory at 1724 London Road, Cleveland, Ohio, as part of its new program of expansion. The new property includes a one-story monitor type steel and brick building having 36,000 square feet of floor space on a lot of 70,000 square feet. The building was used by the Parker Appliance Co. during the war, and since has been unused.

BOSTON RUBBER GROUP HEARS TALKS BY HOLT AND SMITH

Approximately 300 members and guests attended the Fall Meeting of the Boston Rubber Group, held at the Copley Plaza Hotel in Boston, Mass., on October 4. The program featured two interesting talks, one on "Far Eastern Rubber Production: Progress and Prospects," by Everett G. Holt, Rubber Advisor of the Department of Commerce, and the other on "Properties and Uses of Silastic, the New Heat Stable Silicone Elastomer," by Earle Smith, technical consultant of the Dow Corning Corp. During the business session of the meeting, Harry Atwater (Hood Rubber), Joseph Haas (Hodgman Rubber), and Lawrence R. Clarke (Haartz-Mason) were appointed members of the Nominating Committee.

Holt on the Far East

Mr. Holt prefaced his discussion by reviewing the facts learned during his recent three-month trip to the principal countries occupied by the Japanese during the war. He emphasized the increased postwar importance of production by natives and small-holders who are furnishing over 60% of the output, as compared with 45% before the war, and predicted that the lower production costs of the natives would mean more severe price competition for the estates in the future.

The speaker estimated natural rubber production in the Far East, exclusive of India and Burma, at 600,000 tons for 1946 and 950,000 tons in 1947. Approximately 210,000 tons of new production was predicted for the first half of 1946, leaving 390,000 tons to be expected for the last six months. Flush yields were said to be substantially aiding the output. Stocks in these countries when the Japanese surrendered are now estimated at 320,000 tons.

The principal barriers to estate production were described as political unrest in the Netherlands East Indies and lack of labor in Malaya and Indo-China, while the production of small-holders has been retarded chiefly by inadequate transportation and lack of trade goods in the Netherlands Indies and British Borneo. Natives have been much quicker to resume production than the estates.

Siam Anxious to Trade

Mr. Holt pictured Siam as a country anxious to trade with the United States, having already sold 9,000 tons to the Rubber Development Corp. and swinging rapidly into production after a slow start. In Indo-China, the French estates are slower in getting under way. The bulk of the 170,000 tons assembled there at the end of the war has now been shipped. Some 22,000 tons was destroyed by Annamite action, and there was serious loss of young rubber plantings in fires last spring. Ports in North Borneo and Labuan suffered heavy war damage reducing warehouse and handling facilities.

Conditions in Malaya improved rapidly during the first half of 1946, and Mr. Holt paid tribute to the planters there in verse which he wrote in Singapore. He expects that various economies under operation by the Malayan Rubber Estate Owners Co. will be incorporated in future estate practice. Malaya was said to be ready to do business on a large scale with native rubber more significant than before the war.

Netherlands Indies Output

In the Netherlands Indies, with greater production capacity than any other country, no company-directed production on estates was reported possible at present in Sumatra or Java. The Dutch have collected some stocks in ports of Java, but are mainly concentrating on native rubber in Borneo, the only important rubber area in their control. Meanwhile, rubber produced by natives in Sumatra, as well as stocks looted from estates there, is moving to Malaya, where 54,000 tons was received during the first half of 1946 and over 14,000 tons during July and August.

Considering the outlook for 1947, Mr. Holt stated that with the clearance of old stocks now nearly completed, improved qualities of natural rubber can now be expected in 1947, although there will be a smaller proportion of first quality smoked sheets, a dearth of plantation crepes, and latex will continue in limited supply. The proportion of native rubber types is expected to be even higher than in 1946, which means more browns and blankets. The types of natural rubber in the United States will also be affected by the types and qualities accumulated in our national stockpile.

Smith Dicusses Silastic

In his talk, Mr. Smith first described how Silastic is produced and compounded, and then discussed its various applications. He pointed out that the silicone elastomer is being used commercially in two forms, as pastes for coatings, laminates, and moldings, and as crepes for molding and extruding. Thin layers of the pastes were said to cure in five minutes at temperatures ranging from 450° F. to 650° F. This makes possible the continuous production of Silastic coated glass cloth for use as gasketing materials and winding tapes.

Mr. Smith said that Silastic crepes are available in four types for molding and extruding. These differ, due to the use of various fillers, in durometer, tensile strength, elasticity, and electric properties. Silastic moldings require 250° F. to 350° F. for three minutes while under pressure. Oven cure is then necessary to develop the desired physical properties. Extruded materials may be autoclaved for three to five minutes for the initial cure. Silastic coated wire was described as the only wire suitable for lead wires of high temperature silicone insulated motors or oven equipment. Because of its heat and oil resistance, Silastic is also being adopted for use in and around internal combustion engines and jet engines.

GOLF TOURNAMENT FEATURES PHILADELPHIA GROUP OUTING

A golf tournament was the feature attraction of the annual outing of the Philadelphia Rubber Group, held on September 20 at the Oak Terrace Country Club in Ambler, Penna. Approximately 130 members and guests were in attendance.

Winners in the golf tournament included W. R. "Bill" Cleary (Barrett) with a low score of 76 and Ralph Davis (MacEwan & Smith) with a high score of 153. Honors for the kicker's handicap were divided among Arthur Nellen (Lee Tire), A. J. Hawkins (DuPont) and Guy Lucian (Lee Tire). Prizes were awarded to all winners, in addition to which dozens of prizes went to holders of lucky number tickets.

Those contributing gifts which made the prizes possible included the following: Akron Standard Mold Co., L. Albert & Son, American Cyanamid Co., American Zinc Sales Co., Barrett Division, Binney & Smith Co., Godfrey L. Cabot, Inc., Caldwell Co., Carter Bell Mfg. Co., Chipco, Inc., Cleveland Liner & Mfg. Co., E. I. du Pont de Nemours & Co., Farrel-Birmingham Co., Flintkote Corp., B. F. Goodrich Chemical Co., J. M. Huber, Inc., *India Rubber World,* Monsanto Chemical Co., Moore & Munger, H. Muehlstein & Co., National Standard Co., Naugatuck Chemical, Neville Co., New Jersey Zinc Sales.

Also Pequanoc Rubber Co., Phillips Petroleum Corp., Pittsburgh Plate Glass Co., H. N. Richards Co., H. M. Royal, Inc., RUBBER AGE, Scott Testers, Inc., Sharples Chemicals Co., Stamford Rubber Supply Co., Stanco Distributors, Inc., Standard Chemical Co., Sun Oil Co., Thiokol Corp., Wm. R. Thropp & Sons, Titanium Pigment Corp., United Carbon Co., U. S. Rubber Reclaiming Co., R. T. Vanderbilt Co., and Witco Chemical Co.

Instrument Society Meets

At the annual conference and exhibit of the Instrument Society of America at the Hotel William Penn in Pittsburgh, Penna., on September 19, E. R. Rowland, of the University of Akron, delivered a talk on "Temperature Control of Reactors for Synthetic Rubber," and J. W. Graeb, of Polymer Corp., Sarnia, Ont., discussed "Organization of the Instrument Division at Canada's Synthetic Rubber Plant." In his talk, Mr. Rowland reviewed the development of temperature control instruments from the time that standard plants for producing GR-S were erected throughout the country in 1942 and 1943 to the present, while Mr. Graeb described the organization of the instrument division at Polymer Corp. and its relation to other departments at the plant.

An index to Vol. 59 of RUBBER AGE will be found on Pages 123 to 126 of this issue.

CONNECTICUT RUBBER GROUP HOLDS FIRST ANNUAL OUTING

The Connecticut Rubber Group held its first annual outing at the Meadowbrook Country Club in Hamden, Conn., on September 21. In spite of inclement weather, approximately 115 members and guests participated in a sports program which included a golf tournament, softball game and other field events. An attractive assortment of prizes was awarded the winners of the various sporting events and games.

In the golf tournament, the kicker's handicap was won by Thomas Skipp, with William Fairclough as runner-up. Other winners of the golf tournament follow: *Low Gross:* Fred Salamon, A. Murdock and V. N. Hastings; *High Gross:* B. Fairbanks and P. Rooney; *Low Net:* M. T. Hedges; *High Blind Hole:* Al Mazur; *Low Blind Hole:* Thomas Skipp, William Fairclough, F. F. Salamon, Fred Salamon and G. J. Schwenk.

Winners of the other events are as follows: *Boccie:* Thomas Skipp and Ernest Owens; *Horseshoes:* Thomas Skipp and Ernest Owens; *Ring Toss:* W. J. O'Brien, Jr.; *Ball Roll:* D. R. Welter, A. E. Bald, and V. N. Hastings; *Darts:* Ernest Owens and I. Monroe; *Marble Game:* V. N. Hastings, R. E. Blake, and H. K. Encke. The softball contest was won by a New Haven-Bridgeport team which defeated a Naugatuck-Valley Peddlers aggregation.

Concerns Donate Prizes

Prizes for the outing were made available through the cooperation of the following concerns: Accurate Insulated Wire Corp., Advance Solvents & Chemical Corp., Allison Co., Aluminum Flake Co., American Cyanamid Co., American Zinc Sales Co., Armstrong Rubber Co., Bakelite Corp., J. T. Baker Chemical Co., Barrett Division of Allied Chemical & Dye Corp., Binney & Smith Co., Black Rock Manufacturing Co., Sidney Blumenthal & Co., Stewart Bolling & Co., Brockton Machine Co., Brooklyn Color Works, Bunatak Chemical Co., Godfrey L. Cabot, Inc., Caldwell Co., Callaway Mills, Inc., H. O. Canfield Co., Carter Bell Manufacturing Co.

Also Chemical & Pigment Co., Cleveland Liner & Manufacturing Co., Consolidated Products Co., Colloids, Inc., Connecticut Hard Rubber Co., Cooke Color & Chemical Co., Continental-Mexican Rubber Co., E. I. du Pont de Nemours & Co., William D. Eggleston Co., Erie Engine & Manufacturing Co., Farrel-Birmingham Co., General Latex & Chemical Corp., General Magnesite & Magnesia Co., Givaudan-Delawanna, Inc., B. F. Goodrich Chemical Co., Goodyear Rubber Co., C. P. Hall Co., Harmon Color Works, Herron Bros. & Meyer, Hird & Connor, Inc., J. M. Huber, Inc., R. B. Huber, *India Rubber World,* Kerite Co., Middletown Rubber Corp.

Also Midwest Rubber Reclaiming Co., Monsanto Chemical Co., Moore & Munger, H. Muehlstein & Co., National Sherardizing & Machine Co., Naugatuck Chemical, Neville Co., New Jersey Zinc Co., A. C. Nispel, Inc., Oakite Products, Inc., Pennsylvania Industrial Chemical Corp., Pequanoc Rubber Co., Philipp Bros., Inc., Philips Petroleum Co., Pittsburgh Plate Glass Co., Raybestos-Manhattan, Inc., Reichard-Coulston, Inc., John Royle & Sons, RUBBER AGE, A. Schrader's Sons, A. Schulman, Inc., Scott Testers, Inc., Seamless Rubber Co., Sharples Chemicals, Inc., Shell Oil Co., Stamford Rubber Supply Co.

Also Stanco Distributors, Inc., Standard Chemical Co., Stanley Chemical Co., Sun Oil Co., C. J. Tagliabue, Thiokol Corp., Wm. R. Thropp & Sons Co., Titanium Pigment Corp., United Carbon Co., U. S. Rubber Co., U. S. Rubber Reclaiming Co., R. T. Vanderbilt Co., Vansul & Co., Waltham Bleachery & Dye Works, Inc., Weller Chemical Co., Whitney Blake Co., Whittaker, Clark & Daniels, Inc., L. G. Whittemore, Inc., C. K. Williams & Co., Charles T. Wilson Co., Witco Cheimcal Co., and Xylos Rubber Co.

Kaolin Production in 1945

Production of kaolin in 1945 amounted to 939,988 short tons, valued at $9,072,927, an increase over the 873,056 tons, valued at $7,858,740, reported for the previous year, according to figures released by the U. S. Bureau of Mines. Kaolin found its largest use in 1945 in the manufacture of paper, which took 59% of the total. Rubber clay, which increased 84% over 1944, was 12% of the total. Kaolin used in refractories accounted for 10%, pottery 8%, and the remaining 11% went into a variety of products, including linoleum, chemicals, paints and plasters.

Chicago to Meet November 1

The Fall Meeting of the Chicago Rubber Group is scheduled to be held on Friday evening, November 1, at the Morrison Hotel in Chicago. Dr. William F. Tuley, assistant general sales manager of the Naugatuck Chemical Division of the U. S. Rubber Co., will deliver an address on "Present and Future Synthetic Rubber Polymers," while Dr. H. A. Winkelmann, of the Dryden Rubber Co., will discuss "The History of the Rubber Industry in Chicago."

Akron to Meet on November 22

The Fall Meeting of the Akron Rubber Group is scheduled to be held at the Mayflower Hotel in Akron on November 22. No speakers for the meeting have been announced at this writing, but an interesting program is promised.

GOLF TOURNEY FEATURES OUTING OF CHICAGO GROUP ON JULY 27

Approximately 130 members and guests attended the annual summer golf outing of the Chicago Rubber Group, held at the Acacia Country Club on July 27. The committee for the outing included Charles E. Wonder (Van Cleef Bros.), Charles M. Baldwin (United Carbon), William N. Crumpler (George S. Mepham Corp.), and D. M. Pratt (Marbon Corp.).

An announcement was made at the outing that the United Carbon Co. had donated a trophy which is to be awarded to the golfer scoring low gross at the Group's annual outings each year. The award, to be known as the United Carbon Company Trophy, is to be given for permanent retention when won three consecutive years. L. B. Wagner (Metro Rubber Products) was this year's winner of the trophy.

A surprisingly large number of prizes were made available through the cooperation of the following concerns: Adamson-United Co., Advance Solvents & Chemical Corp., L. Albert & Son, American Zinc Sales Co., Bibb Manufacturing Co., Binney & Smith Co., Godfrey L. Cabot, Inc., George B. Carey Co., Carter Bell Manufacturing Co., Chemical By-Products Co., Chicago Belting Co., Chicago Cutting Die Co., Cleveland Liner & Manufacturing Co., Commerce Petroleum Co., Darling & Co., Desmond Co., E. I. du Pont de Nemours & Co., Farrel-Birmingham Co., General Atlas Carbon Co., Genseke Bros., B. F. Goodrich Chemical Co., Great Lakes Solvents, Inc., C. P. Hall Co., Herron Bros. & Meyer, J. M. Huber, Inc., *India Rubber World.*

Also Douglas P. Johnstone Co., Kraft Chemical Co., Marbon Corp., Geo. S. Mepham Corp., Midwest Rubber Reclaiming Co., Monsanto Chemical Co., H. Muehlstein & Co., National Rubber Machinery Co., Naugatuck Chemical, New Jersey Zinc Sales Co., Pequanoc Rubber Co., Phillips Petroleum Co., Rex-Hide, Inc., RUBBER AGE, Scott Testers, Inc., Sherwin-Williams Co., Southeastern Clay Co., Stanco Distributors, Inc., Standard Chemical Co., Sun Oil Co., Titanium Pigment Corp., U. S. Rubber Reclaiming Co., R. T. Vanderbilt Co., Wilmington Chemical Corp., and Witco Chemical Co.

To Air Condition Laboratory

B. F. Goodrich Co. has ordered about $333,000 worth of air conditioning for its new research laboratory buildings being built at Brecksville, Ohio, from the Carrier Corp., Syracuse, N. Y. In announcing receipt of this order, Carrier revealed that the air conditioning for this laboratory had been worked out with designers of the building to provide concise control of the temperature and humidity of air in the laboratory in order to improve the precision with which chemical experiments and tests may be conducted.

NAMES IN THE NEWS

DR. JOHN N. STREET, assistant director of laboratories of the Firestone Tire & Rubber Co, Akron, has replaced DR. H. L. TRUMBULL as manager of research and development for the Office of Rubber Reserve at Washington, D.C. Dr. Trumbull has returned to his work as manager of chemical laboratories for the B. F. Goodrich Co.

E.A. BRITTAIN, general superintendent of the Wolverhampton, England, plant, and J. B. JAMES, development manager of the Argentine plant, both of the Goodyear Tire & Rubber Co., are currently in Akron on business trips. They will remain until the end of November before returning to their respective posts.

DANIEL PRATT, formerly associated with the U. S. Rubber Reclaiming Co. and the Sponge Rubber Products Co., has joined the laboratory staff of the Essex Rubber Co. at Trenton, N. J.

T. K. SEIBERLING, manager of the heel and sole department of the Seiberling Rubber Co., Akron, has been elected president of the Seiberling Latex Products Co., succeeding his father, the late CHARLES W. SEIBERLING.

J. K. LOCKRIDGE, manager of the synthetic rubber division of the Goodyear Tire & Rubber Co., in Torrance, Calif., since February, 1945, has returned to Akron as manager of the new plastics production division of the Goodyear Aircraft Corp.

W. O. "BUTCH" HAMISTER, well-known sales representative of the Naugatuck Chemical Division of U. S. Rubber Co., recently became a benedict.

EDWIN MARTIN, formerly plant chemist at the Buffalo, N. Y., plant of the General Cable Corporation, is now associated with the Hewitt Rubber Corporation.

T. B. TOMKINSON, controller of the B. F. Goodrich Co. since 1927 and a director from 1928 to 1940, will retire at the end of the current year after 43 years of continuous service with the company.

HOWARD K. NASON, associated with the Monsanto Chemical Co. since 1936, and director of development of the company's central research deparment at Dayton, Ohio, since 1944, has been promoted to associate director of that department.

WALTER RITZ, associated with various suppliers as a technical representative for many years, including the General Latex & Chemical Co., and the United Carbon Co., has joined T. C. Ashley & Co., Boston, in a similar capacity.

DR. WILLARD D. PETERSON, who formerly did administrative work in research and development at the Central Research Laboratories of the General Aniline & Film Corp., has been named associate director of the organic research division of the J. T. Baker Chemical Co.

DAN M. RUGG, vice-president of Koppers Co., Inc., has been appointed general manager of the company's newly-created chemical division, with headquarters in Pittsburgh, Penna.

CLYDE O. DELONG, who has been associated with the B. F. Goodrich Co. since 1928, most recently as manager of sundries sales, has been named merchandise manager of the company's industrial products sales division. MR. DELONG recently was awarded the Meritorious Civilian Service Award for services on the staff of the Navy Rubber Survey and as consultant to the Navy Rubber Director.

HARVEY S. FIRESTONE, JR., president of the Firestone Tire & Rubber Co., was the principal speaker at a dinner held on September 20 at the Waldorf-Astoria Hotel in New York City which commemorated the one hundredth anniversary of the independence of the Republic of Liberia.

HARRY A. WALKER, formerly industrial engineer and safety manager at the Charlestown, Indiana, powder bag loading plant, operated by the Goodyear Tire & Rubber Co. for the government, has been appointed plant engineer of the company's tire factory in Lecheria, Mexico.

RICHARD L. KROSEN has resigned as president and director of the Johnson Rubber Co., Middlefield, Ohio, in order to devote his entire time to the Cleveland Sports Goods Co., Cleveland, Ohio.

MARVIN ACHTERHOF, chemist at the Ohio Rubber Co., Willoughby, Ohio, has been appointed as one of two members of the Willoughby Village School Board to serve on the Willoughby Union High School Committee.

ERVIN W. SOUTH, vice-president of the Hamilton Rubber Manufacturing Co., Trenton, N. J., has also been named sales manager of the company. He has been with the company for over 20 years.

E. W. THOMPSON, formerly manager of the Louisville, Kentucky, synthetic rubber plant, which is being operated by E. I. du Pont de Nemours & Co. for the government, has been appointed to the newly-created position of production manager of the company's rubber chemicals division.

J. V. STROUTS, formerly superintendent of the vitamin department of the special commodities plant of General Mills, Inc., at Keokuk, Iowa, has been promoted to manager of the plant.

FRED E. WILCOCK, who has been associated with the Athol Manufacturing Co., Athol, Mass., since 1927, and ROBERT M. TYLER, a member of the company's sale. department since 1936, have been named assistant treasurer and assistant sales manager, respectively, by the company.

DR. DAN M. MCDONALD, who has served with the medical department of the Firestone Tire & Rubber Co. for seventeen years, has retired as head of that department.

E. J. MCGEHEE, a vice-president of Koppers Co., Inc., Pittsburgh, Penna., since 1941, has been appointed sales manager of that company.

GEORGE L. ABBOTT, formerly vice-president and general sales manager of Graton & Knight Co., Worcester, Mass., is now president, treasurer and general manager of a new company, known as the Warren Belting Co., Inc., Worcester, Mass.

JAMES W. KELLEY has been appointed president of the Aetna Rubber Co., Cleveland, Ohio, succeeding the late CHARLES MASHEK.

WARREN S. LOCKWOOD, foreign trade consultant and formerly executive vice-president of the Rubber Manufacturers Association, has been appointed vice-president in charge of overseas activities of the World Trade Foundation of America, Inc.

DR. WALLACE E. CAKE, assistant director of the plantation division of the U. S. Rubber Co., has embarked on a three-month tour of the Far East for the company to investigate possible latex production there and survey unsettled political conditions which have prevented the company from starting rehabilitation of its Sumatra estates.

ANDRE BLUMENTHAL, vice-president of Sidney Blumenthal & Co., Inc., New York City, has been named assistant general manager of the company.

DR. JOHN H. DILLON, formerly assistant director of research of the chemical and physical research laboratories of the Firestone Tire & Rubber Co., has been appointed research director of the Textile Research Institute and the Textile Foundation.

DR. R. P. DINSMORE, vice-president in charge of research and development of the Goodyear Tire & Rubber Co., has been named to the Advisory Committee on Ordnance and Research of the Army Ordnance Association.

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GOODRICH REPORT RECOMMENDS FREE WORLD RUBBER MARKET

Recommendations that serious consideration be given to returning natural rubber to a free market basis at the end of this year, and that the government sell or lease to private industry its facilities for producing synthetic rubber as soon as the world shortage in rubber supply is eased, are included in a study released recently by the B. F. Goodrich Co., Akron.

The appraisal of supply, progress, costs, and outlook for natural and synthetic rubber at the first anniversary of V-J Day was the ninth in a series of rubber studies the company has issued since 1940, when it first put synthetic rubber tires on the market, "to call attention to the nation's vulnerability with respect to supplies of natural rubber." This report comes at the halfway point in the rubber industry's generally accepted two-year postwar "transition period."

The analysis pointed out that establishment of free market conditions would be the first step toward achieving the economic benefits long foreseen as chief by-products of the coming competition between natural and synthetic rubber. The report listed these benefits as lower-cost finished products, wider use of rubber in new applications, broadened markets, and increased employment possibilities.

As things stand now, the study shows, general-purpose synthetic rubber could be manufactured and sold by private industry at a 600,000-ton-a-year rate for between 15 and 17 cents a pound, which includes plant amortization, selling expense, and return on invested capital. The current cost of some natural rubber delivered in the United States from the Far East is between 25 and 26 cents a pound.

World-Wide Rubber Demand

The report indicates that for the present world-wide demand for rubber is such that it is impossible to get a true picture of how preference for natural rubber will stand up with the indicated differential of eight or more cents a pound. However, it predicted that some time in 1947 the available supplies will be such as to allow manufacturers a free choice of one or the other, or both, in varying combinations, on the sound basis of price relation to finished product performance.

In urging that the government proceed with the program, recommended by the Inter-Agency Policy Committee on Rubber, of selling or leasing to industry the synthetic rubber producing facilities, the report reiterated the warning first made by John L. Collyer, president of the B. F. Goodrich Co., in June, 1943, that in all postwar decisions on rubber policy the matter of military security be the foremost consideration. His proposals have been maintenance, in plants kept in condition and ready to operate, of 600,000 tons of standby capacity, and minimum actual production and use of 200,000 tons a year from those plants.

Discussing technical progress, the study noted that at present, taking the realm of large tonnage uses as a whole, natural rubber still has the advantage in performance over synthetic rubber. It added, however, that great steps in progress have been made since the early months of this country's experience in using synthetic rubber in (1) the rubber itself, notably in making improved variations of the main-type rubber formula; (2) compounding; (3) product construction, through greater use of ravon and other synthetic filaments; and (4) in designing products, such as the passenger car tire Goodrich is now producing which is said to outwear prewar natural rubber tires.

Probable World Consumption

The study included a chart outlining probable world consumption of rubber for the first three postwar years. It indicated that the total rubber consumption requirements of the United States would be 1,000,000 tons this year, 900,000 in 1947, and 800,000 in 1948, which is still well above the 651,000 tons of consumption in 1940, the last normal prewar year. The predicted minimum of synthetic rubber production to meet consumption needs were shown as follows: 740,000 tons this year, 500,000 in 1947, and 250,000 in 1948. Over the same period, natural rubber supply to the United States was forecast as 360,000 tons in 1946, 500,000 in 1947, and 650,000 in 1948. In each of these years, 100,000 tons would be going into the building of adequate working stocks and stockpiling.

Joins Akron Standard Mold

Lester T. Sharp

Lester T. Sharp, formerly associated with the engineering department of the Firestone Tire & Rubber Co., has been appointed to the sales staff of the Akron Standard Mold Co., Akron. Mr. Sharp was graduated from the University of Illinois, where he obtained a B.S. degree in mechanical engineering in 1936. Prior to joining the Firestone organization, he was associated with the Perfection Stove Co., Cleveland, Ohio, as production manager of one of the company's plants.

PASSENGER TIRE PRODUCTION INCREASED SLIGHTLY IN JULY

Production of passenger car tires by American manufacturers in July rose .05% over the previous month, increasing from 4,921,297 units to 4,923,968 units, according to the latest statistical report of the Rubber Manufacturers Association. Production for the first seven months of 1946 was estimated at 35,661,085 units, as compared with 11,980,380 produced during the first seven months of 1945.

Truck and bus tire production decreased 4.80% in July, totaling 1,061,266 units, as compared with 1,114,797 units in June. Total production of automotive pneumatic casings in July amounted to 5,985,234 units, a decrease of .84% over the 6,036,094 produced during the previous month, while the output of passenger car, truck and bus tubes decreased .14%, from 5,709,905 units in June to 5,701,851 units in July. Production of automotive pneumatic casings for the first seven months of 1946 amounted to 44,425,077 units, as compared with 23,211,941 for the first seven months of the previous year.

The Association's report notes that several factors worked against high production in July. Many plants were shut down for inventory and vacations during the first week of the month. Moreover, strikes closed two factories for the entire month.

July shipments of passenger car tires amounted to 5,010,131, a decrease of .70% over the 5,045,542 shipped in June, while inventories at the end of July decreased 10.41%, from 2,290,220 units to 2,051,732 units. Shipments of truck and bus tires rose from 1,088,470 units in June to 1,236,461 units in July, an increase of 13.60%, while inventories decreased 17.69% to 838,737 at the end of July. Passenger car, truck and bus tube shipments totaled 5,959,194 units in July, an increase of 4.54% over the previous month, while inventories at the end of July amounted to 3,954,149 units, a decrease of 9.65% over the end of June.

Passenger car tire shipments reached a record during the first seven months of 1946. The report shows that manufacturers shipped almost as many replacement passenger car tires between January 1 and July 31 of this year as they did in the entire year of 1941, which was the highest since 1929. Out of total factory shipments of passenger car tires through July 31, amounting to 35,331,459 units, 4,649,537 were shipped to automobile companies for original equipment and only 323,894 units were shipped for export, leaving a balance shipped for domestic replacement purposes of 30,358,028 tires. This compares with the highest replacement figure for the entire year of 1941 of 34,119,000 tires.

According to the report, rising automobile production is claiming a larger proportion of the monthly tire output than it did early in 1946. As a result, monthly allotments to tire dealers may be somewhat under April and May levels.

Organize Webber and Smith

Robert I. Webber and Holland W. Smith, Jr., have announced the formation of a new company, to be known as Webber and Smith, with headquarters at 52 Vanderbilt Ave., New York 17, N. Y. The new company will specialize in pigment and chemical sales and technical service.

Mr. Webber, after completing voluntary service in World War I, augmented his formal education with three years' experience in the Lead and Zinc Pigment Manufacturing Division of the Eagle-Picher Lead Company. After four years' sales service with Eagle-Picher, he resigned to become Eastern Manager of the Evans Lead Corporation in New York. During the recent war years, Mr. Webber supplemented his lead oxide service—which he expects to continue—with the sale of products manufactured by Thompson-Weinman and Company, and the Chemical Products Corporation.

Mr. Smith, a native of Georgia, was educated at Darlington School and Georgia School of Technology. After completing his eductaion, Mr. Smith entered the mining and production division of Thompson-Weinman and Company. Following this practical experience in pigment production, he obtained a leave of absence to spend a few years in the paint industry. Later, Mr. Smith came to New York with Thompson-Weinman and Company, and has been active in product development, technical service, and sales in the Metropolitan area.

Mr. Webber and Mr. Smith are both well-known in the Metropolitan New York area, and as "Webber and Smith," will continue the sale of Atomite, Lesamite, and other Thompson-Weinman extenders, maintaining the same type of service which the partners, as individuals, have offered. Additional pigments and chemicals will be handled as well. The formation of this new company was brought about so that they might better serve their customers and friends through these enlarged activities.

To Manufacture Sheeting

Presto Plastic Products Co., Inc., is the name of a new company at 40 Worth St., New York 13, N. Y., which will shortly begin the manufacture of synthetic rubber sheeting. Officers of the new concern are J. P. Frank, president; Henry Hilsenroth, vice-president, and Morton Frank, secretary and treasurer. R. C. Murray, formerly general manager of the Casto Co., Parkersburg, W. Va., has been named general manager of the new company.

Resigns as Research Head

Lester Kirschbraun, vice-president in charge of research of the Flintkote Co., has resigned as an officer of the company, but will continue in an advisory capacity. In charge of Flintkote research since 1918, Mr. Kirschbraun has more than 200 patents filed in his name.

FINANCIAL NEWS

Pharis Registers Stock Issue

Pharis Tire & Rubber Co., Newark, Ohio, has filed a registration statement with the Securities and Exchange Commission covering the issue of 100,000 shares of $20 par value cumulative convertible preferred stock and an unspecified number of 50c par value common stock to be reserved for conversion of new preferred. The company will apply net proceeds to pay off bank loans of $1,375,000 and will use about $416,500 to finance the purchase of a building from the Reconstruction Finance Corp. Another sum of about $108,500 will be used to complete construction of the building. For the eight month period ended June 30, the company reported a net profit of $816,659, equal to $3.85 each on 212,000 common shares. Net sales for the period totaled $12,549,267.

Columbian Carbon Co.

First Half: Net income of $2,668,191, which is equal to $1.65 a share, and which compares with $1,671,362, or $1.04 a share, for the same period of 1945. Net sales amounted to $16,527,105, as compared with $13,311,884 for the corresponding period of the previous year.

American Cyanamid Co.

Six Months: Net profit of $4,261,869, after deducting $3,100,000 for Federal and foreign taxes, which is equal to $1.44 a common share, and which compares with $3,097,639, or $1.01 a share, for the first half of 1945.

Union Absestos & Rubber Co.

First Half: Net income of $192,468, which is equal to 40c a share on 475,376 capital shares. Comparative figures for last year are not available because the company was privately owned until its initial public financing early in 1946.

Anaconda Wire & Cable Co.

First Half: Net income of $578,949, which is equal to $1.37 a share, and which compares with $533,946, or $1.27 a share for the corresponding period of the previous year.

United Carbon Company

First Half: Net income of $1,369,671, which is equal to $3.44 each on 397,885 shares, and which compares with $922,812, or $2.32 a share, for the corresponding period of the previous year.

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Servicized Sues Carey Company

Servicized Products Corp., 6051 West 65th St., Chicago 38, Ill., and Albert C. Fisher, president of the company, recently filed suit in the U. S. District Court at Cincinnati, Ohio, asserting that the Philip Carey Co., Lockland, Cincinnati, had engaged in unfair competition in the manufacture of a rubber bituminous compound The petition stated that Clarence Edwards and Lynn W. Young, formerly superintendent and sales manager, respectively, of the Chicago concern's factory, disclosed trade secrets to the Cincinnati company after entering its employ. They were also named defendants in the action. The suit alleged that the Carey company and Messrs. Edwards and Young conspired to divulge trade secrets of the Chicago concern in connection with the manufacture and distribution of "Careylastic," a product similar to "Para-Plastic," manufactured by Servicized. In giving the trade secrets to the Carey company, the petition charged, the former employees violated their contracts. The court was asked for an injunction to restrain the two men from disclosing information, and to restrain the Carey company from further employment of the two in the production of rubber bituminous sealing compounds, and from using the trade name "Careyplastic" in competition with "Para-Plastic."

Delivers Talk on Adhesives

Dr. W. O. Baker, of Bell Telephone Laboratories, Inc., Murray Hill, N. J., delivered a talk on "Cohesion, Adhesion, and Structure of Polymers" on October 15 in Atlantic City, N. J., during the four-day series of meetings of the ASTM Committees on Plastics, Adhesives, and Electrical Insulating Materials. Dr. Baker covered the results of X-ray diffraction studies in plastics.

Johnson City Plant Sold

The government-owned rubber sole and heel plant in Johnson City, N. Y., has been acquired from the War Assets Administration by Artcraft Metal Products, Inc., West Haven, Conn., for $2,747,000. Only other bidder for the plant was the Endicott-Johnson Corp., which offered $1,500,000 for the buildings, land, and machinery.

Rare Metal Products Moves

Rare Metal Products Co., manufacturers of antimony sulfide, has moved its plant, offices and laboratories from Belleville, N. J., to Atglen, Penna. The new telephone number is Atglen 81. D. A. Shirk is president of the company.

Denman Tire & Rubber Co.

First Half: Net income of $163,975, which is equal to 84c each on 195,075 common shares. Net sales amounted to $1,973,989.

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20% Better detrition
30% Better dynamometer
40% Better curing
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NEW POLYMERS AUTHORIZED BY OFFICE OF RUBBER RESERVE, RECONSTRUCTION FINANCE CORPORATION

Listed below are types and properties of new experimental GR-S polymers (including GR-S latices) which have been authorized by the Office of Rubber Reserve, Reconstruction Finance Corporation, since publication of those listed in our August issue. Procedures for the distribution and sale of these polymers will be found in our October, 1945, issue.

X-Number Designation	*Manufacturing Plant*	*Date of Authorization*	*Polymer Description*	*Special Characteristics*
X-313-GR-S	Goodrich, Port Neches	———	GR-S-10 type polymer made with sodium sulfide shortstopper, 45-55 Mooney.	This polymer should show better processing characteristics than GR-S-10.
X-327-GR-S	U. S. Rubber, Institute	8/22/46	Masterbatch containing 100 parts Buca A clay and 100 parts of a GR-S-type polymer made with sodium sulfide shortstopper, 40 Mooney viscosity, with 1.5 parts EFED.	Clay masterbatches are reported to have superior processing and handling characteristics. For use in stocks requiring this type of material.
X-329-GR-S	Firestone, Lake Charles	8/14/46	X-307-GR-S latex coagulated with alum.	X-307 is a GR-S type polymer made with MTM modifier.
X-330-GR-S	Goodrich, Port Neches	8/20/46	GR-S-10 made using a slightly different rosin acid soap by the continuous process.	For the same purpose use as GR-S-10.
X-331-GR-S	Goodyear, Akron	9/10/46	Continuous GR-S with a slightly lower-than-normal soap content.	
X-332-GR-S	Goodrich, Port Neches	9/6/46	GR-S type 10 polymer made in a continuous polymerization unit to 48-58 Mooney.	This polymer should show some processing improvement.
X-333-GR-S Latex	Firestone, Akron	9/23/46	Low rosin GR-S latex with a normal styrene ratio; high solids (55-60%) content.	General purpose use.
X-338-GR-S	Goodrich, Port Neches	9/25/46	Same as X-282 except made to higher conversion and a lower monomer to water charge ratio.	For same purpose use as X-282.
X-341-GR-S	Firestone, Lake Charles	9/27/46	GR-S made by charging 75 parts isoprene, 25 parts styrene, using an activated recipe, 60 Mooney.	The isoprene-styrene polymer shows improved hysteresis characteristics in carcass type stocks and may have improved tack.
	Reauthorizations have, been issued for the following eight polymers which were previously authorized, made, and in consumers' tests found advantageous:			
X-141-GR-S	Firestone, Lake Charles	9/27/46	Same as X-341	Same as X-341
X-222-GR-S	Firestone, Akron	8/22/46	Alum-coagulated GR-S made with dehydrogenated rosin soap.	Polymers made with dehydrogenated rosin soap show a quality advantage, i.e., better tack.
X-250-GR-S	Goodrich, Louisville	8/23/46	Regular GR-S at 45 ± 5 Mooney. Shortstopped with hydroquinone, no antioxidant.	General purpose use.
X-274-GR-S	National Synthetic, Louisville	8/22/46	GR-S-10 shortstopped with sodium sulfide and stabilized with Stalite.	For same purpose use as GR-S-10. Produced for materials where a special non-discoloring antioxidant is required.
X-276-GR-S Latex	Goodyear, Akron	8/27/46	Low rosin soap GR-S latex with a high solids content of 58%.	General purpose use.
X-278-GR-S	U. S. Rubber, Naugatuck	9/3/46	50/50 butadiene/styrene ratio. Sodium oleate and glue emulsifiers. Shortstopped with hydroquinone, 2 parts PBNA antioxidant, alum-coagulated.	Use in closure and sealant compounds.
X-293-GR-S Latex	National Synthetic, Louisville	8/28/46	Similar to Type II latex with Daxad emulsifier, hydroquinone shortstopper and Stalite antioxidant.	For use in adhesives. Dry polymer from this latex is so sticky the Mooney is too low to be measured.
X-307-GR-S	Goodrich, Port Neches	8/30/46	GR-S-10 except that MTM modifier is used in place of DDM.	This polymer is being made and tested in view of the possible future shortage of DDM.
X-315-GR-S	U. S. Rubber Institute	9/26/46	Masterbatch containing 50 parts Silene EF and 100 parts of a 40 Mooney rubber, stabilized with 1.5 EFED.	For use in industrial products and specialties where this type of polymer is desired.
X-317-GR-S	U. S. Rubber, Institute	8/30/46	GR-S-20 AC made with a non-staining shortstopping agent, using 1.5 parts EFED as stabilizer.	For use in goods where a non-staining antioxidant is desired.

CANADIAN NEWS

Viceroy Manufacturing Co., Ltd., has announced that it will redeem on November 1, 1946, all outstanding first mortgage bonds by payment of principal amount together with accrued interest and premiums ranging from .25% to 2% of principal amounts on the different maturities. The company also has revealed that a new issue of $660,000 first mortgage bonds, dated August 15, 1946, has been sold. The issue consists of $360,000 serials of 2½% to 3½% and $300,000 of 3½% fifteen-year bonds due August 15, 1961.

Goodyear Tire & Rubber Co. of Canada, Ltd. has declared a quarterly dividend of $1.00 a share on common stock, which was paid on October 1 to stockholders on record as of September 3, and 50c a share on the 4% preferred stock, payable on October 31 to stockholders on record as of October 1.

According to the *Montreal Gazette*, Wallace A. Bartlett, chairman of the board of the Dunlop Rubber Co. of Australia, has indicated that passenger and truck tires produced in Australia cost less than in any other country in the world. Mr. Bartlett is said to have pointed out that in Canada passenger and truck tires cost 45.6% and 60.4% more, respectively, than in Australia. In the United States the increase is said to be 14.4% and 38.4%, respectively, while in Great Britain the increase is reported as 5.4% for both passenger and truck tires.

Monsanto Chemical Co. of Canada, Ltd. has begun production of polystyrene in a new plant in Montreal, Quebec, whose output is expected to exceed Canada's prewar requirements for the widely used thermoplastic material. It is said to be the first polystyrene plant in the British Empire. With 50% capacity now in operation, the new unit will attain full production shortly after November 1, serving both Canada and export markets. Approximately 95% of the equipment used in the new plant is of Canadian origin. The base material, styrene monomer, is being purchased from the Polymer Corp.

Calco Chemical Division of North American Cyanamid, Ltd. has been formed, with sales offices and warehouses in Montreal and Toronto, to distribute a complete line of dyestuffs, chemicals and intermediates to the plastics, textile, leather, and paper industries. This division will also handle textile resin finishes and pigments. W. H. Kieffer is manager of the new division.

Foundation work is under way for the new plant which the Foxboro Co., Ltd. is erecting on a 3½-acre site in the Ville LaSalle section of Montreal. Completion of the plant is expected in the spring of 1947. The company plans to manufacture its well-known industrial instruments at the new plant.

Carl B. Cooper, who has been associated with the Goodyear Tire & Rubber Co. of Canada for the past 25 years, has been appointed general sales manager of the company.

Entering its four year of production, Polymer Corp., Sarnia, Ont., has announced that the company plans to produce 118,000,000 pounds of synthetic rubber during the next year, which is an increase of 11,000,000 pounds over the output for the past twelve months.

A munitions plant outside the city of Ottawa has been purchased by a British company for the production of plastics for export, it was disclosed recently by Sir Lewis Sterling, chairman of the board of the new Canadian company and vice-chairman of the British firm which is investing the capital. According to Sir Lewis, the Canadian business will be in production by the end of this year and expects to export $1,000,000 worth of plastics within six months. The factory at peak production is expected to employ approximately 600 persons.

The synthetic rubber exhibit of the Polymer Corp., which had been previously shown in Windsor, Stratford, Sarnia, and Ottawa, Ontario, ended a week-long showing in Montreal, Quebec, on October 12. The exhibit portrayed in graphic detail the series of processes in the production of GR-S and Butyl rubber. Displayed at the exhibit were such synthetic rubber products as tires and tubes, footwear, foam rubber cushions, conveyor belting, pipe fittings, life rafts, waterproof garments and various molded articles.

According to a report from Kitchener, Ontario, the plant of the Dominion Rubber Co., Ltd., in that city will be restricted to production for the domestic market only, with its export trade to be allocated to new plants being constructed by the parent organization, U. S. Rubber Co., in Argentina, South Africa, Australia, Great Britain and Sweden. The report assumes that the expansion program recently started at the Kitchener plants, which entailed an expenditure of over $1,000,000 in additions and new buildings, may be curtailed as a result of the new export trade development.

U.R.W.A. Holds Convention

The United Rubber, Cork, Linoleum and Plastic Workers of America, CIO, better known as the United Rubber Workers, held its annual convention in San Francisco, Calif., the week of September 16. All principal officers of the union were re-elected at the convention, the only opposition developing in the race for the vice-presidency. After considerable debate, the convention approved the raising of annual dues from $1.00 to $1.50 per member. Salary increases were also approved for the officers of the union and for both district and field representatives. A proposal calling for the establishment of an international policy committee, the function of which will be to handle problems affecting wages, contract negotiations and collective bargaining on a wider scale than plant basis, was approved. Charges were made by various speakers during the convention that rubber manufacturers are still engaged in "decentralization" tactics designed to "play workers in one section of the country against those in another" and that some of these manufacturers were withholding tires deliberately from the consumer market.

Purchases Tennessee Plant

U. S. Rubber Co. has purchased from the War Assets Administration several modern manufacturing buildings at Milan, Tenn. The new facilities, which were units of the Wolf Creek Ordnance plant, an important shell loading plant during the war, will be used for the manufacture of fabric rubber-soled casual shoes. Installation of heavy machinery, such as mills, calenders, and vulcanizers, has already been started. Manufacturing operations are scheduled to begin some time this fall.

Confirms Troy Plant Purchase

B. F. Goodrich Co. has confirmed reports that it has leased a government-owned building adjoining the Waco Aircraft Co. in Troy, Ohio. The plant, used for the manufacture of gliders during the war, will house the aircraft brake and wheel manufacturing division of the company. Earlier this year the company purchased the airplane wheel and brake division of Hayes Industries, Inc., Jackson, Mich., and manufacturing operations will now be transferred from the Hayes plant to Troy.

Establish Shira Rubber Co.

Shira Rubber Co., Ravenna, Ohio, was recently organized to engage in the manufacture of household protective covers from vinyl plastic fabrics and vinyl film. Officers of the company are Mrs. M. J. Shira, president and treasurer; Austin Lengs, vice-president, and Morris M. Jobe, secretary. Mr. Jobe will also serve as sales manager. The company plans to add toys and novelties to its line of manufactured goods.

LOS ANGELES NEWS

The first meeting of the Los Angeles Rubber Group for the year 1946-47, held on October 1, at the Mayfair Hotel in Los Angeles, and sponsored by the Goodyear Tire & Rubber Co., was the most successful in the history of the Group.

The main dinner and meeting of the evening was preceded by the regular meeting of the Technical Group. Elliott "Mac" McLaughlin (Royal), who was to have been chairman, was suddenly called East on a business trip. His duties were taken over by Wm. J. Thomas (Firestone), secretary of the Technical Group.

The guest technical speaker was W. A. Ladd, physicist in charge of electron microscopy at Columbian Carbon Company's Research Laboratories in Brooklyn, New York. Mr. Ladd's subject was "Colloidal Carbon-Rubber Investigations With the Electron Microscope."

During his talk he showed three-dimensional photos demonstrating the structure of types of carbon black. He also showed motion pictures of the electron microscope he constructed for his firm. The members of the Group agreed that Mr. Ladd's talk was one of the finest and most informative ever given.

John W. Snyder (Binney & Smith) also appeared with Mr. Ladd.

After a delicious turkey dinner, C. M. Reinke (Reinke & Amende) welcomed the 220 attending members of the Group and turned the meeting over to Phil Drew (Goodyear) who acted as chairman for Goodyear.

D. W. Sanford (Goodyear) delivered a dynamic talk on the present critical tire situation, backed by production statistics. For 1946 the production goal for all makes of tires was set for 86 million. As of October, 1946, a record of 81 million were produced, with the prospect that actual production would fall very little short of the set goal.

Mr. Sanford predicted that even in 1947 there would not be a surplus stock of auto tires, despite the greater output of the rubber industry. In 1941 a total of 50 million auto tires were produced, while in 1946, 67 million have been produced.

"The crux of the problem," Mr. Sanford said, "is that the demand for tires is still far above our capacity to produce." As an example Mr. Sanford cited the fact of a record 28 million cars on the road today.

The second speaker introduced by Mr. Drew was Frank Steele, former plant manager of the Goodyear plants at Gadsden, Alabama, and presently plant manager of the Los Angeles plant.

Mr. Steele corroborated Mr. Sanford's statistics, and went on to draw a parallel of the truck tire situation.

The high point of the meeting was the inspirational talk, "America at Flood Tide," by Arthur C. Horrocks, Chief Counsel, Goodyear Public Relations Department.

Mr. Horrocks impressed upon the members of the Group their responsibilities in working for peace in this atomic age. Now was the time, he said, to prevent future wars, since the next atomic war could easily result in the ruin of our civilization.

"Now," Mr. Horrocks said, "America is at its flood tide for opportunities to work for peace."

He cited the present day moral relapse as an aftermath of World War II, causing many business men to concern themselves more with profits than a lasting secure economy.

The ovation the Group gave Mr. Horrocks at the end of his talk was a testimony of their agreement and enthusiasm.

An intermission was declared after Murray O. Nixon (Goodyear) submitted the audit report of the Group. Then the chairmen and guests posed for photos by RUBBER AGE reporters.

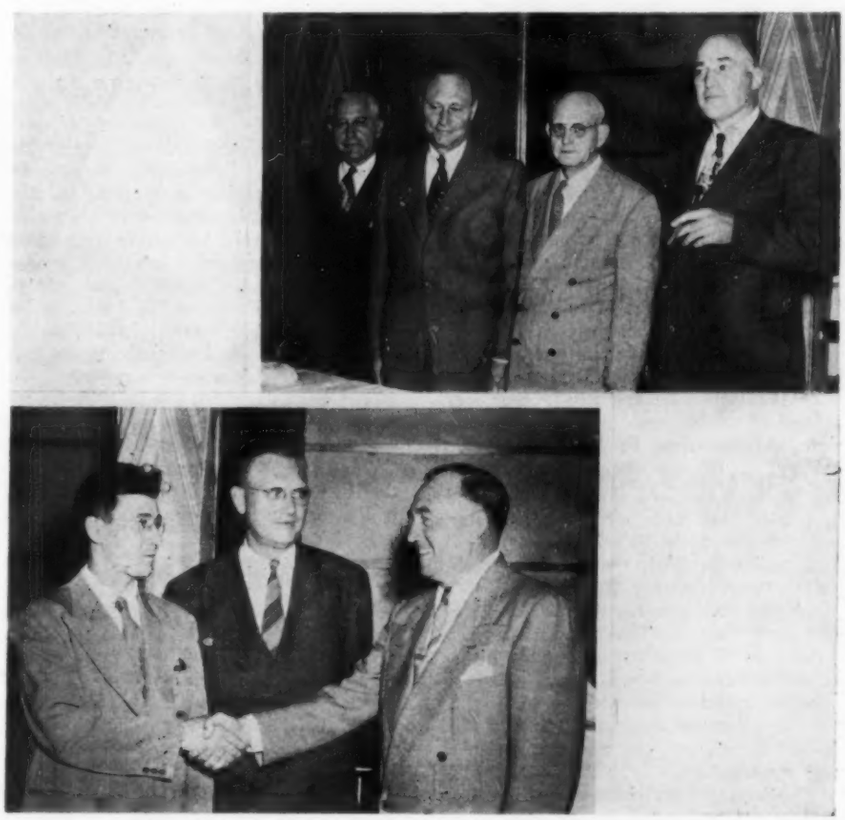
The remainder of the evening was spent viewing motion pictures of both the Rancho Don Lugo Outing, and the San Diego fishing trip sponsored by the Group.

The Goodyear Company gave cigarette lighters to all members present as table favors, and also presented a display of a 1946 model radio and 1946 pressure cookers, for the edification of the rubber group members.

W. J. Thomas (Firestone), secretary of the Technical Group of the Los Angeles Rubber Group, said that natural rubber is on its way back. Several sources in South America were beginning to produce rubber. He also stated that an unexpected source was the stockpiles of rubber captured from the Japs after the war. This captured rubber was allocated among the many U. S. rubber manufacturing firms.

Galen Norton, vice-president of the Kirkhill Rubber Co., of Los Angeles, announced the resignation from his company of J. Carroll Walker. Mr. Walker also resigned his position as secretary of the Los Angles Rubber Group.

Mr Walker is now the owner and operator of a large avocado ranch in Southern California. His former associates in the rubber industry predict Mr. Walker's avocados will bounce.



View of two scenes at the meeting of the Los Angeles Rubber Group held on October 1. TOP: Left to right, Frank A. Steele, D. W. Sanford, Arthur C. Horrocks, and Phil W. Drew, all members of Goodyear. BOTTOM: Left to right, W. A. Ladd (Columbian Carbon), John W. Snyder (Binney & Smith), and C. M. Reinke (Reinke & Amende).

OBITUARIES

Charles W. Seiberling

Charles W. Seiberling, first vice-president of the Seiberling Rubber Co. and one of the founders of the Goodyear Tire & Rubber Co., died in the Akron City Hospital in Akron of a heart ailment on September 20. He was 85 years old. Mr. Seiberling was stricken at his country home in Northfield, near Akron, the day prior to his death, and was rushed to the Akron hospital. The heart attack was said to have been brought on by overwork.

Born January 26, 1861, at Western Star, Summit County, Ohio, Mr. Seiberling was educated in the Akron public schools and at Oberlin College in Oberlin, Ohio. After two years at college, he joined his father's concern, the Empire Reaper & Mower Works, in Doylestown, Ohio, manufacturers of mowers, reapers, binders and other agricultural equipment. This was in 1880. Starting as a laborer in the plant, he rose to foreman, then superintendent and eventually became a director of the company.

The next venture of the Seiberling family was to organize the India Rubber Co. in 1895, with Charles W. as its first secretary. With the experience gained from this first venture in the budding rubber industry, "C.W." and his older brother, F. A. Seiberling, were the guiding lights in organizing the Goodyear Tire & Rubber Co. in 1898 with a $3,500 loan. Operations of the company were started in an old East Akron paper box factory. By 1916 the company had grown to be the largest tire manufacturer in the world. F. A. became the "Little Napoleon" of the industry. He was often described as "the brain" and C. W. as "the heart" of the business. C. W. became secretary and vice-president of Goodyear, remaining with the corporation until 1921 when he and his brother lost control of the concern on its reorganization. At that time F. A. was 61 years old and C. W. was 60.

Most men that old would have retired after suffering such a financial disaster, but not the Seiberling brothers. With new capital in 1921, the brothers established the Seiberling Rubber Co., with F. A. as president and C. W. as vice-president, and developed it into a firm valued at $7,000,000. In recent years active management was transferred to younger members of their families, but the organization was said to have still leaned heavily on the advice of C. W. and F. A.

The business activities of C. W. Seiberling covered many fields. He served as president of the Seiberling Latex Products Co., and of its subsidiary, the New Bremen Rubber Co.; was president of the Thomas Phillips Co., paper bag manufacturers; vice-president of the Citizens Savings and Loan Co. and held the same position with the Macedonia and Northfield Banking Co.

Throughout his life, C. W. devoted his energy and resources toward helping the under-privileged. He was a member of the board of trustees of the Edwin Shaw Sanatorium, was responsible for the organization of Akron's Community Chest in 1919 and active in that organization not only in Akron but in surrounding communities until his death, helped organize and finance both Girl Scout and Boy Scout movements, was an ardent supporter of the Handicapped Action group and donated generously to all churches regardless of creed, color or race. The Rotary Club, Akron University Club, Parent-Teacher Association, Akron Community Service Center, Portage, Fairlawn and Congress Lake Country Clubs are only a few of the many organizations he belonged to as a member or director.

C. W. Seiberling is survived by a daughter and two sons, Lucius M., general sales manager of the Seiberling Rubber Co., and T. K., manager of the company's heel and sole department. The latter has also been named president of the Seiberling Latex Products Co.

B. E. "Barney" Oldfield

Berna E. "Barney" Oldfield, pioneer auto racer, died at his home in Beverly Hills, Calif., on October 4. He was 68 years old. Born in Wauseon, Ohio, Mr. Oldfield was a bicycle racer in his youth, and in that capacity he became acquainted with Henry Ford, who had built his famous racing car, the "999," and wanted it tested. Driving the "999" at the Indianapolis Fair Grounds in 1903, Mr. Oldfield was clocked officially as the first human to travel a mile a minute. Retired from the race track in 1918, he engaged in many business enterprises. At one time he operated the Oldfield Tire Co. in Akron which was affiliated with the Firestone Tire & Rubber Co., but which had a relatively short existence.

Walter Douglas

Walter Douglas, who had served as president of the Phelps Dodge Corp. from 1917 to 1930 and had been president of the American Mining Congress, died at his home in Chauncey, N. Y., on October 3. He was 75 years old. Mr. Douglas became associated with the firm he was to head, then known as Phelps Dodge & Co. in 1902. He was appointed general manager, and served in that capacity until 1910, when he became general manager of the Phelps Dodge Corp. After seven years, he was elected to the presidency. A widow, two sons and three daughters survive.

Edward Hutchens

Edward Hutchens, president and general manager of the Utility Manufacturing Co., manufacturers of rubber and allied machinery at Cudahy, Wisconsin, died of pneumonia in Indianapolis, Indiana, on September 21. He was 76 years of age.

Born in Monrovia, Ind., in 1870, Mr. Hutchens attended grade school in Indianapolis, leaving school at the age of 12 to become a millwright in one of the local woolen mills. Four years later, in 1886, he became assistant engineer of the Dennison Hotel in Indianapolis, and two years after that joined the Indianapolis Light & Power Co. as assistant chief engineer.

The late Mr. Hutchens

After an extensive course in mechanical refrigeration, Mr. Hutchens joined the Indianapolis Brewing Co. as chief engineer, remaining with that company until 1898. From 1898 to 1913 he was associated with the Westinghouse-Church-Kerr Co., of New York City, and while with that organization he was in charge of rebuilding operations at the plant of the former G. & J. Tire Co. in Indianapolis and that of the former Federal Rubber Co. at Cudahy, Wisc.

As a result of his work with Federal Rubber, he joined that company in 1913 as a supervising engineer, leaving the company in 1915 to organize the Utility Manufacturing Co. As head of the Utility organization he was instrumental in the development of tire building, automatic measuring and cutting machines for the rubber industry, and supervised complete installations of rubber factories both in this country and abroad. Prior to the last war, Mr. Hutchens took an extensive trip around the world, combining business with pleasure.

Funeral services were held in Milwaukee, Wisconsin, with internment in the Wisconsin Memorial Cemetery. Two sons and a daughter survive. Howard O. Hutchens, one of the surviving sons, is factory manager of the Gillette Tire Division of the U. S. Rubber Co. at Eau Claire, Wisc.

An index to Vol. 59 of RUBBER AGE will be found on Pages 123 to 126 of this issue.

Charles Mashek

Charles Mashek, president of the Aetna Rubber Co., died suddenly in Cleveland, Ohio, on September 8 at the age of 63. Mr. Mashek was born in Cleveland in 1883. Before joining Aetna about eight years ago, he had been identified with Cleveland retail circles. He entered business as a young man and early in his career became connected with the Bailey Co., a retail store in Cleveland. After working his way through different phases of the merchandise field he spent a number of years as an executive in charge of several departments. After leaving the Bailey Co., Mr. Mashek went to the Ames Co., a women's apparel shop, where he was for some years president and where he also supervised branch establishments in a number of Ohio cities. He was a member of the Cleveland Athletic Club. A widow and daughter survive.

Ernest R. Preston

Ernest R. Preston, manager of the commercial sales division of the Goodyear Tire & Rubber Co., died in his home in Akron on September 27 at the age of 55. Mr. Preston was born at Natick, Mass., and was graduated from Williams College in 1911. He joined Goodyear immediately after his graduation and served the company in London and Akron. In 1921 he went to England where he stayed until 1925. He returned to Akron and was put in charge of truck and bus tire sales, holding that post until 1936 when he was appointed to the position he held at the time of his death. A widow, son and daughter survive.

Cabot Buys Nash Unit

Cabot Carbon Co. has purchased the Nash Carbon Black plant at Guymon, Oklahoma, for $550,000 from the War Assets Administration. The plant, which has been operated by Cabot since its completion in October, 1945, was built to manufacture 15,000,000 pounds of channel black a year at capacity production, but under Cabot operation the output has been at the rate of 18,000,000 pounds a year. It was one of six plants constructed by the government to meet the wartime shortage of carbon black for military rubber products.

Changes Corporate Name

Industrial Oven Engineering Co. has changed its corporate name to Industrial Ovens, Inc. The company also has announced its establishment in its new plant and offices at 13825 Triskett Road, Cleveland 11, Ohio. C. A. Litzler is president of the company, which specializes in engineering, designing, and installing industrial heating and processing equipment, with particular accent on continuous operations in the handling of the materials to be treated.

New Reinforcing Pigment

Indulin, a new reinforcing pigment when incorporated into synthetic or natural rubbers in the latex form, as by coprecipitation, has been developed and introduced by the Industrial Chemical Sales Division of West Virginia Pulp and Paper Co., 230 Park Ave., New York 17, N. Y. The new material, which is said to also offer important advantages as a dispersing agent in coprecipitating other pigments with rubber, is a lignin derived from pine wood by processes associated with a large sulfate pulp mill. It is a brown, free flowing, amorphous powder, which can be shipped in paper, wood or metal containers. It has a specific gravity of 1.3, a bulk density of 25 lbs./cu. ft., a packed density of 30 lbs./cu. ft., and an equilibrium moisture between 3 to 5%. Indulin consists of about 65% carbon, 5% hydrogen, and 30% oxygen, and is considered to be a polymer of many homogeneous units, having a unit weight of about 840 each. It may be readily etherified, esterified, nitrated, chlorinated, mercurated, and halogenated. It reacts readily with phenols, amines and aldehydes, and with sulfides and sulfites. It is soluble in dioxane, phenols, various amines, glycols, glycol ethers, etc., and is insoluble in hydrocarbons, chlorinated solvents, and oils. Indulin is now available from an experimental plant capable of supplying carload quantities for commercial size evaluations.

Introduce Stellar-R Clay

Stellar-R Clay, said to be the whitest clay available today, is currently being marketed by the Standard Chemical Co., Akron 8, Ohio. Whereas ordinary hard clays for rubber are simply dried and ground, Stellar-R is said to undergo a chemical treatment and digestion prior to drying and grinding which removes the materials responsible for the dark color and high water absorption of ordinary clay. The new clay is described as a superior pigment in the following respects: whiteness, no retardation of cure, speed of extrusion, and low water absorption. It is of particular interest in the manufacture of white and colored rubber goods.

New Compounding Ingredients

Herron Bros. & Meyer, 82 Beaver St., New York 5, N. Y., recently introduced several new compounding ingredients, including Herco-Wax, a plasticized petroleum wax designed to promote efficiencies in processing, Herco-H.T., a hydrocarbon oil, and Herco-Plas, a petroleum product made from selected crudes by a special refining process, intended for use as a processing aid. Herco-Wax is a semi-solid in appearance, has a melting point of 125° F., a specific gravity of .96, and is soluble in most solvents. The supplier recommends that it be used in place of petrolatum, process oil and scale wax now commonly used. Herco-H.T., the hydrocarbon oil, has a specific gravity of 1.031, a flash point of 330° F., an aniline point of 55° F., and is dark green in color. It is especially recommended for use in GR-M (neoprene) compounds where it is desired to employ large amounts of softener without subsequent blooming. Herco-Plas, which was developed as a softener and processing aid for mixing, calendering or extruding, is a viscous liquid, with a specific gravity of 0.88, dark in color. Advantages claimed include shorter mixing time, softer stocks, reduced nerve, and increased tack and elongation.

Additional Navy Specifications

Three additional specifications on rubber have been issued by the Bureau of Ships of the Navy Department since our last report. Copies of these specifications may be secured by addressing a request to the Navy Department, Bureau of Supplies and Accounts, Washington 25, D. C. The specifications follow:

Navy Dept. Spec. 33R1h—Rubber, Synthetic; Gaskets, Packing, Sheets, and Strips, July 15, 1946.

Navy Dept. Spec. 33B5a — Bearing Strips, Synthetic Rubber (Water Lubrication), August 1, 1946.

Joint Army-Navy Spec. JAN-P-358—Protectors (Plugs), Ear, Synthetic Rubber; and Containers, June 25, 1946.

Acquires Rhode Island Factory

U. S. Rubber Co. has announced that additional production facilities will be established in Newport, R. I., to increase the output of golf balls and rubber heels. The plant, which is expected to employ about 100 persons, will be located in a city-owned building, leased to U. S. Rubber and known as the Coddington School. The work in Newport will consist chiefly of trimming, finishing, and golf ball winding. The rubber compounding, molding and other preliminary processes will be done in the company's plant in Providence, R. I., which for many years has been producing golf balls and heels. This will be the company's third plant in Rhode Island. More than 1,900 persons are employed in Providence and some 900 in a wire insulating plant at Bristol.

Here is the final "Scott Tester Data Sheet." Request any others you need to complete your Set of 8

MAINTENANCE DATA SHEET NO. 8

CALIBRATION - INCLINE - PLANE

To check calibration of the IP-4 machine, weigh the carriage complete with all attachments (clamp, pen and weights for range to be checked). Carriage should weigh exactly twice the effective capacity (i.e. a 10-lb. cap. carriage should weigh 20 lbs.). On the IP-2, a 250-gram capacity carriage, complete with attachments, should weigh 591.51 grams—other capacities in same proportion. (A carriage weight should weigh an amount equal to the required capacity divided by the sine of the angle of maximum inclination.)

After determining that carriage weight is correct, see that rims of wheels and tracks are smooth and free of all dirt, rust, etc. Place carriage on track midway of its run. Adjust pen to rest in O horizontal on the chart. Then start the plane inclining. The line drawn will start vertical —indicating combined starting friction and inertia—but should move away from the vertical within the first two small spaces in the chart to indicate a satisfactory calibration.

If it does not, proceed as follows:

1. See that pen point is in good mechanical condition and sliding freely.
2. With commercial solvent and soft rag clean foreign materials from wheels and track.
3. Check tracking of wheels.
4. Remove wheels and wash ball bearings; repack per instructions.
5. Plain-bearing Wheels: Check condition of pivots, and indentation in axle and point in frame.
6. In replacing either type bearing, take care not to restrict rotation of wheel.
7. Check track alignment; tracks must be parallel and in same plane.

The many Scott Testers supply the needs of testing textiles, rubber, wire, paper, etc., up to 1 ton tensile.

REQUEST "CATALOG & DATA BOOK NO. 45"

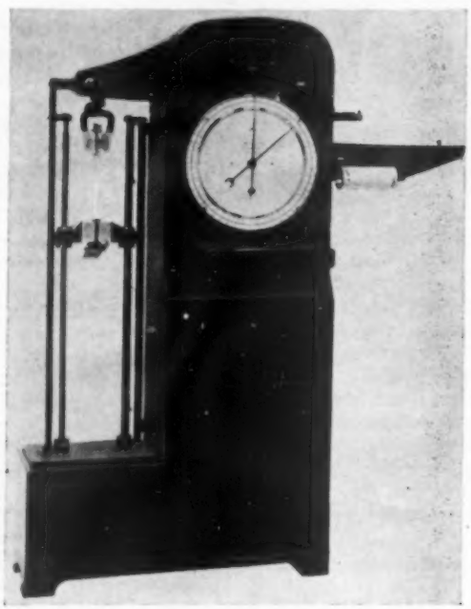
SCOTT TESTERS, INC.

85 Blackstone St., Providence, R. I.

NEW EQUIPMENT

Olsen Lo-Cap Testing Machine

A testing machine designed especially for low capacity testing and which is used in production control and research testing of rubber, textiles, cordage and certain types of plastics, is being manufactured by the Tinius Olsen Testing Machine Co., 500 North Twelfth St., Philadelphia 23, Penna. Known as the Olsen Lo-Cap, the machine is guaranteed to be within .5%



Front view of Olsen machine.

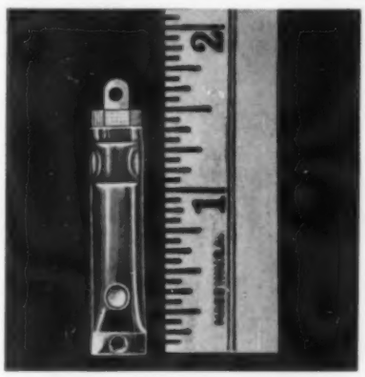
above one-fifth capacity on any load range, and within one dial division below one-fifth capacity.

Weighing is accomplished by the linear displacement of a calibrated pendulum, which automatically rotates the load pointer on the Olsen multi-masked dial, the load pointer of which rotates twice to capacity. Load application in the machine is accomplished either by a hydraulic or mechanical (electronic) loading system. Because of its unlimited stroke and positive rate of load application, the mechanical loading method has been used for testing rubber, cordages, plastics and other materials which have relatively large elongation values.

The standard Lo-Cap is equipped with self-aligning type "K" grips for tensile tests. According to the company, this type of grip has proven to be the most convenient and satisfactory for testing materials within the capacity of the testing machine. Strip material as thin as .001-inch can be tested with these grips. These self-aligning grips are provided with open fronts for quickly inserting specimen and file inserts. The serrations of the inserts supplied with the grips is selected to hold securely the material to be tested. If the file inserts become worn they can be replaced with a new set.

Mighty Mite Sealed Thermostat

Especially designed in size and shape for molding in rubber and many plastics, the "Mighty Mite," a perfected sealed thermostat, is currently being marketed by the Mechanical Industries Production Co., 230 Ash St., Akron, Ohio. The thermostat is reported built to withstand the toughest kind of treatment without



changing its temperature setting, pre-set to the user's temperature specifications, and custom-engineered to give extra safety and heat control accuracy. It has ⅛-inch silver contacts. The standard model is pre-set for fixed temperatures up to 300° F. Other models are available for settings up to 600° F.

According to the manufacturer, the thermostat not only is tamperproof, but dust and waterproof. The copper jacket has high thermal conductivity which makes the thermostat highly responsive to temperature. By the use of Fiberglas insulation, neither humidity nor freezing weather can affect its consistent operation. The sealed tubular construction withstands great external pressure, and is said neither to bend nor break in contrast to thermostats using stamped or assembled cases. The standard model shown is designed for use up to 300 watts, 110 volts, or 150 watts, 220 volts a-c non-inductive load. One of Mighty Mite's construction features is the over-size contact points. These are big ⅛-inch cold-headed, spun-in silver contacts, which result very noticeably in a slower let-down of temperature change and which is reported to triple its life.

FOR LOW HEAT BUILD-UP USE PHILBLACK A

FOR FURTHER DETAILS, SEE AD ON PAGE 4

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WEATHER-OMETER
equals years of
outdoor exposure

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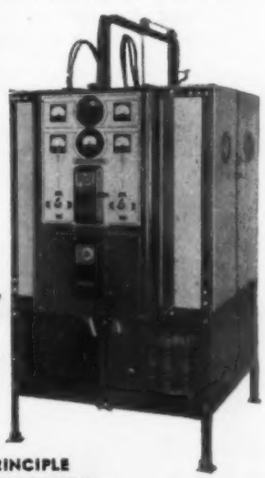

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Fade-Ometers

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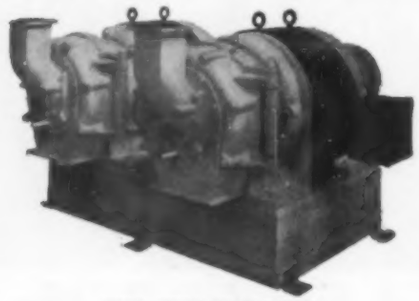

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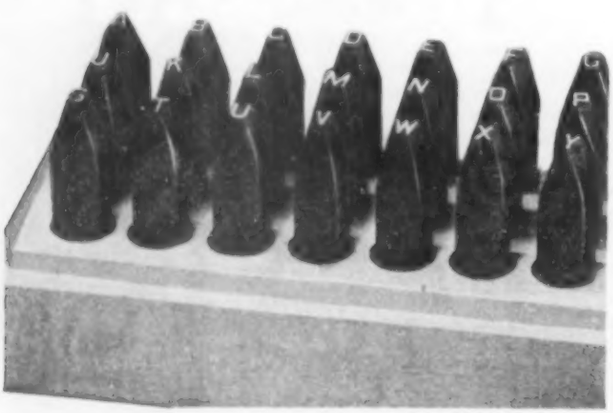
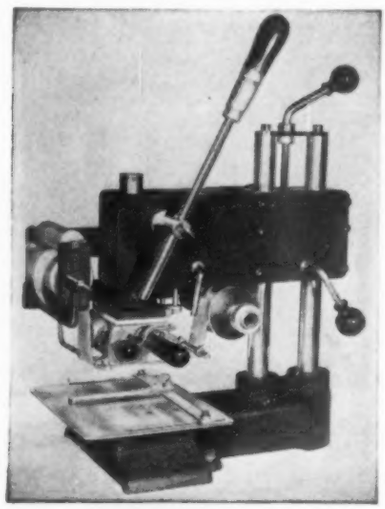


THE HOGGSON & PETTIS MFG. CO.
141A Brewery St., New Haven 7, Conn.

Improved Roll Leaf Stamping Press

A newly designed roll leaf stamping press for stamping on hard rubber, plastics, laminates, fabrics and other materials has been introduced by the Peerless Roll Leaf Co., Inc., 4511 New York Ave., Union City, N. J. Several revolutionary design features are said to be incorporated in the new press. The head of the



press swings up level to allow for quick changing of dies or type. A Fenwal heat control unit, adjustable up to 300° F., is built into the chase and die holder. The head is insulated so that the press does not get hot even after hours of operation. The chase is interchangeable with a one-inch by four-inch die holder. In addition, there is a three-inch by four-inch die plate designed to fit the die holder.

Extension Type Portable Pyrometer

Wheelco Instruments Co., 847 West Harrison St., Chicago, Ill., has introduced a new extension type portable pyrometer which has been designed to permit a choice of plug-in angle extensions where a number of applications necessitate a universal instrument for measuring and checking temperatures requiring the use of different kinds of thermocouples. A high resistance meter movement consists of baked, processed coils, supported by two lapped pivots resting in two highly polished sapphire resilient jewels. An Alnico No. 5 magnet is said to provide increased ruggedness without loss of sensitivity and a calibrated Briguet spiral automatically corrects every reading for variations in cold junction temperature. To protect the meter when the instrument is not in use, a shunt lever is provided which can be snapped into position with a thumb movement.

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Press for Vulcanizing Rubber Belting

A multiple cylinder hydraulic press, which can be operated at pressures up to 2,250 p.s.i., has been introduced by the R. D. Wood Co., Public Ledger Building, Philadelphia 5, Penna., for vulcanizing rubber belting. The 24 cylinders of the press are arranged in pairs, complete with piping, to make up twelve two-

cylinder units. With this arrangement any pair of cylinders can be cut out at any time. All units are said to be interchangeable and can be removed from the press without dismantling any other part. The two heating platens are machined parallel within .003-inch and given a high grade emery and oil finish. The platens have four parallel steam circuits to provide the necessary heating uniformity. The press is equipped with hydraulic stretcher and clamping units mounted at the ends of the moving platen to maintain tension on the belt while it is being processed. This equipment provides both clamping and stretching force of 60 tons ultimate. The maximum stretching stroke is three feet six inches. The complete press weighs 3,180 tons.

American instrument Co., Silver Spring, Maryland, has developed the **Aminco Climatizer,** an instrument which produces in laboratory test chambers and small-size rooms the average temperatures and humidities that prevail in most countries of the world.

FOR HIGH RESILIENCE USE PHILBLACK A

FOR FURTHER DETAILS, SEE AD ON PAGE 4

No, lock the door *before* it's stolen. In this case, "it" means accuracy, production and profit. . . . Since 1927 the Schuster Magnetic Calender Gauge has consistently served four important ends:

1. It assures uniform thickness in your finished product, down to 1/1000".
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3. It does away with the human equation, *preventing* mistakes.
4. It saves the stock sampled for calender testing.

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REVIEWS

BOOKS

Bibliography of Rubber Literature for 1940 and 1941. Published by the Division of Rubber Chemistry, A.C.S. Available from The Rubber Age, 250 West 57th St., New York 19, N. Y. 6 x 9 in. 296 pp. $5.00.

This bibliography is the fifth in the series begun in 1936. The earlier editions were planned and edited by Dr. Donald E. Cable. This edition follows his plan and is based as previously on the library bulletins prepared by the Technical Library of the United States Rubber Co. Dr. Cable's "Letter-number combination method of identifying references is continued since it greatly expedites the use of cross-references . . . and makes possible a regular sequence of progressive numbers that may be continued serially over a period of years and lends itself to the preparation of a consolidated index at some future time."

"Two additional improvements are contained in the current edition. First, references to patents are included and, second, brief, one-sentence abstracts are furnished with each reference." These are useful and welcome improvements.

"The major objective of the rubber bibliography remains the same, namely, to place between two covers references to all of the literature (this time including patents) on rubber published in some specific period (one or two-year spans) throughout the world, grouping all original articles, reprints, translations, abstracts, etc., in a single reference so that the interested searcher may quickly locate at least one more lengthy abtract or some journal that will carry the entire article or translation in the case of those originally in some foreign language." (The quotations are all from the preface.)

Here are a few rather impressive statistics. The list of subject headings in the Table of Contents contains seventy-four headings, and the number of journals listed and referred to is three hundred and thirty-six. The abbreviation and complete title and address of each journal are given. The author index consists of twenty-four pages of double columns and the subject index similarly of forty-two pages, all in smaller type than that in the main sections. Cross-references are given at the end of each section.

The format is good and the text is easy to read. The proofreading was well done, since the reviewer noted no typographical errors.

The Bibliography Committee of the Division of Rubber Chemistry that was responsible for this good work consisted of J. McGavack, Chairman, C. C. Davis, C. W. Christensen and M. E. Lerner. The Rubber Division and the Rubber Manufacturers Association which provided generous financial assistance are to be congratulated on their efforts.

This volume whets the "reference" appetite for more.

HARRY L. FISHER

•

The First Decade of Batanagar. By Jan Baros. Available from Bata, Limited, Batawa, Ontario, Canada. 7 x 9½ in. 190 pp.

This is the story of Batanagar, a small and young town in India, founded and sponsored by the famous Bata organization, which is now celebrating the tenth anniversary of its existence. The trials and tribulations connected with turning a barren piece of land into a thriving community are outlined in the book which is divided into six sections. The book should prove of special interest to all manufacturers of footwear.

Colloids: Their Properties and Applications. By A. G. Ward. Published by Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. 5 x 7½ in. 134 pp. $1.75.

All of the several excellent accounts of the progress in colloid science issued in recent years have been of an advanced standard. The current handy-sized volume is an excellent attempt by the author to cover the same ground in a more elementary way, so that it serves as an introduction to the subject for those meeting it for the first time. The book is divided into three parts: (1) The Nature of the Colloidal State; (2) The Colloidal Systems; and (3) Colloids in Industry and in Living Matter. Colloidal systems described include the lyophobic sols (suspenoids and emulsoids), gels and pastes, emulsions and foams, and dusts, smokes and fogs. The colloids discussed include rubber and synthetic rubber, cellulose and related substances, proteins, clays, paints and lacquers, and enamels and varnishes. A brief bibliography and a subject index are included.

•

Management Techniques for Foremen. By Richard W. Wetherill. Published by the National Foremen's Institute, Deep River, Conn. 9¾ x 11½ in. 177 pp. Looseleaf. $7.50.

This manual presents a comprehensive picture of the supervisory job and is designed to serve as a practical working tool which the foreman can use as a guide in his daily work. The material is based on many foreman training sessions conducted by or under the direction of the author. It is divided into seventeen sections. Subjects covered include responsibilities, information for the foreman, lining up a job, introducing people, training, safety, quality of work, costs, quantity of work, physical property, working conditions, managing people, rate problems, labor relations, discipline, leadership, cooperation, and advancement.

•

BOOKLETS, CATALOGS, etc.

Sharples Synthetic Organic Chemicals. (14th Edition). Sharples Chemicals, Inc., 123 South Broad St., Philadelphia 9, Penna. 8½ x 11 in. 76 pp.

This booklet is designed to assist consumers of organic chemicals in selecting those products of the company which are suitable for use in existing operations or in the development of new processes. Divided into eleven sections, it covers the following organic chemical groups, which are related either chemically or by application: alcohols, esters and ethers, alkyl chlorides, amines, ureas and amides, dithiocarbamic acid derivatives, phenols, Vultac, mercaptans and sulfides, hydrocarbons, and corrosion inhibitors. The description of products being manufactured commercially in each section is followed by the properties of those compounds in the same class which are in the semi-commercial or laboratory stage of development. Solubility tables on the 150 synthetic organic chemicals covered in the booklet are also included.

•

Witcarb R. (Bulletin No. 46-2). Witco Chemical Co., 295 Madison Ave., New York 17, N. Y. 8½ x 11 in. 40 pp.

This booklet is based on the experimental data previously presented in Witco Bulletins No. 44-2 and 45-2. The material, however, has been revised and condensed to bring together in a single publication the contents of the earlier bulletins. Test results are presented to show the degree of reinforcement obtainable with various loadings of Witcarb R in natural rubber, reclaimed rubber, and a number of the synthetic rubbers. In addition, the behavior of Witcarb R in these compounds is compared with that of various other inorganic and carbon black pigments.

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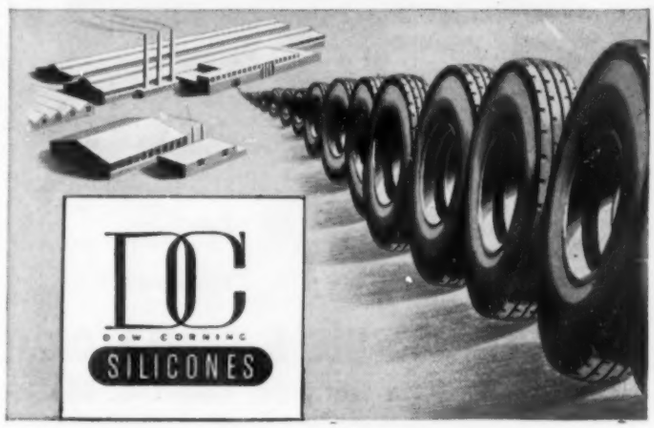

Many of the major rubber companies are changing to DC Mold Release Emulsion No. 35.

★ **It does not build up on mold surfaces**
Cost of cleaning molds is practically eliminated.

★ **It improves surface quality and reduces scrap**
This silicone mold lubricant gives quick release; does not decompose and therefore gives sharp patterns and clean molded surfaces.

★ **It is inexpensive and easy to apply**
Used in concentrations ranging from 50 to 150 parts of water to 1 part of the Emulsion, one application is frequently sufficient for several moldings. Easily applied by brushing or spraying.

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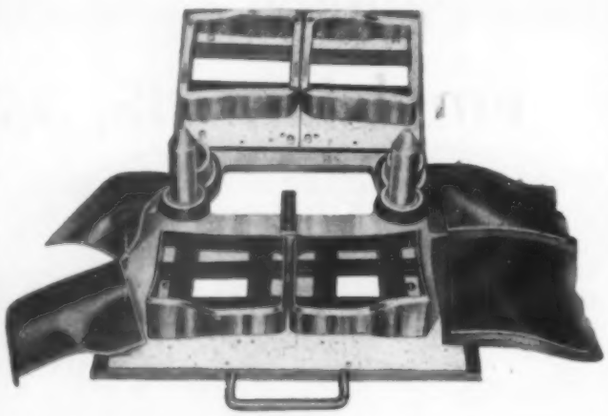

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REVIEWS (CONT'D)

The ABCs of Modern Plastics. Bakelite Corp., 30 East 42nd St., New York 17, N. Y. 6 x 8 in. 40 pp.

Clearly understandable to anyone not fully acquainted with plastics, this booklet is written in a simplified vein to provide a better understanding of plastic materials. It presents a brief outline of the origin, preparation, and uses of plastics, and shows their importance in contemporary living. Complex technical processes are described in simple terms and further explained in colorful charts and illustrations. This profusely illustrated booklet discusses thermosetting and thermoplastic materials; molding and extrusion; all types of laminating, plywood, molding and wood bonding; bonding materials and coating products; impregnating, sealing and calendering materials; cast resins; other fabricated forms such as sheeting, film and fibers; and the various properties offered by these modern plastics. The booklet also shows how the possible future uses of these materials will exert an influence on the world of tomorrow.

•

Falk Steelflex Couplings. (Bulletin No. 4100). Falk Corp., Milwaukee, Wisc. 8½ x 11 in. 32 pp.

A complete description of the standard Steelflex coupling model made by the company for use on hydraulic presses, flaking mills, fans, engine drives, conveyors and other industrial machinery is contained in this bulletin. Construction features of the standard model, such as the resilient gridmember, ease of alignment, flexibility of misalignment, floating cover, seal rings, identical parts, and lubrication, are presented. Other types of Falk flexible couplings for special service and dual-purpose applications are also shown. Several tables cover simplified methods of selecting the proper Falk coupling for motor and turbine drives.

•

Witco Lead Oleate. (Technical Service Report No. R-2.) Witco Chemical Co., 295 Madison Ave., New York 17, N. Y. 8½ x 11 in. 8 pp.

Data on the behavior of the company's lead oleate in GR-S compounds is presented in this technical report. Comparisons are made of stocks containing Witco Lead Oleate with those containing litharge and stearic acid, one group being accelerated by a thiazole accelerator and another by a thiuram accelerator. The results indicate that the company's lead oleate reduces the tendency to scorch of thiuram-accelerated stocks, and it also appears to give better aging properties than the corresponding litharge-stearic stock.

•

Chemurgy Progress and Promise. National Farm Chemurgic Council, Inc., 50 West Broad Tower, Columbus 15, Ohio. 6⅛ x 9¼ in. 68 pp. 50c.

No comprehensive survey has been attempted in this booklet. It contains the views, expressed briefly and simply, of twenty-seven outstanding men engaged in public affairs, religion, agriculture and industry on chemurgy's progress and promise in the future. Included among the twenty-seven short dissertations is one by John L. Collyer, president of the B. F. Goodrich Co., on "The Door Is Open," and another by F. B. Davis, Jr., chairman of the board of the U. S. Rubber Co., on "The Chemurgy of Rubber Manufacture."

•

Rubber Compounding Materials. (Laboratory Release No. 1.) Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. 8½ x 11 in. 28 pp.

Physical test data on three GR-S recipes incorporating one or more of the company's compounding ingredients is presented in this booklet. The compounds from which the data was gleaned include the following: a GR-S extruded and heat resistant compound with Cumar RH, Carbonex, and B. R. V.; a GR-S-channel black (EPC) recipe with 0, 10, 20, and 30 parts of Bardol; and a GR-S-channel black (EPC) recipe with the AX, BX, and CX grades of Cumar.

Physics and Chemistry of Rubber

(Continued from page 73)

acetate and methyl ethyl ketone is not fully understood and is at present under investigation.

(b) *The Effect of Swelling on Elastic Modulus.* The conclusion reached in this case is that the force needed to extend a piece of rubber by a given fraction of its unstretched (swollen) length should be proportional to $(Q + 1)^{1/3}$ where Q is the relative volume of liquid imbibed. Some experimental data for a natural rubber vulcanizate in toluene are shown in Fig. 4, and the theoretical relationship is seen to hold only for fairly high degrees of swelling. The discrepancy for smaller degrees of swelling is associated with small departures from the theoretical form of equation (1), and has been discussed elsewhere *(6)*. It is believed to arise from the rather drastic approximations involved in the models which have been used. Indeed, bearing these in mind, it is perhaps a little surprising that such a highly successful general account can be given of the equilibrium elastic and swelling properties, and their relationship. It would appear from both Figs. 3 and 4, that the theoretical treatment is much more successful in describing the behavior of highly swollen rubbers than for dry ones. This observation suggests that the origin of the discrepancies lies in a certain measure of relatively ordered arrangement of the molecules in dry rubber, this regularity of structure, which is of course neglected in the theory, being broken down by liquids.

It should be pointed out in conclusion that the experiments summarized in Figs. 3 and 4 furnish extremely severe tests of the theory, and that while they reveal some quantitative discrepancies, they do not in the least invalidate the general success of the theoretical analysis in demonstrating the essential molecular basis of elasticity and swelling.

LITERATURE REFERENCES

(1) Kauzmann and Eyring, *J.A.C.S.*, Vol. 62, p. 3113 (1940).
(2) Dawson and Porritt, "Rubber: Physical and Chemical Properties," 1935, p. 435.
(3) Treloar, *I.R.J.*, p. 319 (1945).
(4) Gee, *I.R.J.*, p. 349 (1945).
(5) Orr, *Trans. Faraday Soc.*, Vol. 40, p. 320 (1944); Guggenheim, *Proc. Roy. Soc. A.*, Vol. 123, p. 213 (1944).
(6) Gee, *Trans. Faraday Soc.*, in press.

FOR FURTHER DETAILS, SEE AD ON PAGE 4

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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, OCT. 14, 1946

Natural Rubber

THE return of a free market for natural rubber, with such rubber selling at sharply reduced prices early in 1947, was practically assured in recent weeks, following two events of major importance: (1) Agreements between the United States and the British and Dutch, calling for the delivery of an additional 210,000 tons of rubber, over and above that provided for in previous agreements, at a price of 20¼ cents per pound, f.o.b. Far East; (2) Announcement by the Combined Rubber Committee, charged with international allocations of rubber, of its liquidation by the end of the year.

Both of these events were occasioned by the unexpectedly large amounts of natural rubber which have become available, particularly in Malaya. Natural rubber stocks in the United Kingdom by the end of July were well over 100,000 tons. Since monthly production in Malaya in recent months has been larger than monthly shipments under the allocation system, this stockpile began to reach alarming proportions insofar as rubber producers were concerned. As a result of this situation, British delegates came to the United States to negotiate agreements for additional American purchases.

Return of a free market in natural rubber does not necessarily indicate the removal of domestic controls. In fact, American rubber manufacturers have pointed out that premature lifting of American curbs on the purchase and use of natural rubber, to coincide with the removal of controls over world allocations, may well lead to a chaotic rise in the price of the natural product. It is believed, however, that such curbs may be lifted by the second quarter of next year.

Prices shown below are those established by the Office of Rubber Reserve:

	C	N-C
Plantations—		
Ribbed Smoked Sheets, 1X...	22½	40
Thick Pale Latex Crepe, 1X..	22½	40
Thin Pale Latex Crepe, 1X..	22½	40
Thick Brown Crepe, 1X.....	21⅜	38⅞
Thin Brown Crepe, 1X.....	21⅜	38⅞
Thick Remilled Blankets, #1..	21⅜	38⅞
Rolled Brown or Flat Bark..	18	35½
Smoked Blankets, #1.....	21½	38⅜
Claro Brand 1XRSS.....	22½	40
Sole Crepe Trimmings.....	22	39½
Sole Crepe	22½	40
Wild—		
Uncut Fines, Crude.....	15	29
Cut Fines, Crude.....	15½	29¾
Cut Fines, Washed & Dried..	22½	40
Upriver Coarse, Crude.....	12½	26⅝
Upriver Coarse, Washed & Dried	20¼	37¾
Caucho Ball, Crude	11⅝	24¾
Caucho Ball, Washed & Dried	19½	37
Guayule—		
Carload Lots	17½	31
Less than Carload Lots	18	31½
Balata—		
Surinam Sheet	42½	42½
Manaos Block	38¾	38¾
Colombian Block	38¾	38¾
Peruvian Prime	38¾	38¾
Chicken Wire	23¼	23¼
Latex—		
Normal, Tank Car Lots	26	43½
Creamed, Tank Car Lots	26¾	44¼
Centrifuged, Tank Car Lots..	27¾	45¼
Heat-Concentrated, Carload Drums	29½	47

C for Civilian Use; N-C for Non-Civilian Use.

Scrap Rubber

Some slight improvement in shipments of scrap rubber in recent weeks is reported by dealers. The reluctance of reclaimers to accept mixed natural-synthetic scrap is slowly giving way to the realization that such shipments must be accepted if satisfactory stockpiles are to be maintained at reclaimers' yards. Scrap dealers are hard put these days to make deliveries of all-natural scrap, which situation is responsible for the growing acceptance of the mixed lots. Under Amendment No. 16 to R.P.S. 87, the scrap rubber order, the definition of new scrap tires has been changed to cover "new tires which the manufacturer or brand owner has found defective and not repairable and which such manufacturer or brand owner has slashed or otherwise mutilated prior to his delivery to any person." Prices shown below are ceilings on typical grades of scrap:

(Prices to Consumers, Delivered Akron)

Mixed passenger tires	ton	$20.00
Beadless truck tires	ton	26.00
Mixed truck tires	ton	20.00
Beadless passenger tires	ton	26.00
No. 1 passenger peelings	ton	52.25
No. 1 truck peelings	ton	52.25
No. 2 passenger tubes	lb.	.07¾
Red passenger tubes	lb.	.07½
Black passenger tubes	lb.	.06¾
Mixed passenger tubes	lb.	.06½
No. 2 truck tubes	lb.	.07½
Red truck tubes	lb.	.07¼
Black truck tubes	lb.	.06½
Buffings	ton	35.00
Bicycle tires	ton	15.00
Air bags and water bags	ton	15.00
Boots and shoes	ton	33.00

Tire Fabrics

Despite additional price relief granted to fabric manufacturers, the supply of tire cord and fabric is still not too plentiful, although slightly increased quantities are beginning to reach tire manufacturers. Shutdowns due to lack of tire fabric no longer hang like a Damocles' sword over tire plants. Two additional increases have been granted by O.P.A. in recent weeks in cotton textile price ceilings. In all, to date, four revisions have been made in these prices since the new price control act, representing a rise of approximately 23% since August 1st. The latest revisions were covered by Amendment Nos. 33 and 34 to Supplementary Order 131. Prices shown below are approximately those currently being quoted on various grades of cotton cord:

Standard, Peeler, 12/4/2.....	lb.	.7400
Standard, Peeler, 14/4/2.....	lb.	.7505
Standard, Peeler, 16/4/3.....	lb.	.7610
Extra Staple, Peeler, 12/4/2.....	lb.	.8140
Extra Staple, Peeler, 14/4/2.....	lb.	.8240
Extra Staple, Peeler, 16/4/3.....	lb.	.8345

Sheetings

48x40	36 in.	5.50	.....yd.	—	@13.276
40x40	36 in.	6.15	.....yd.	—	@11.890
40x36	36 in.	6.50	.....yd.	—	@10.723
48x48	40 in.	2.50	.....yd.	—	@27.594
48x48	40 in.	2.85	.....yd.	—	@23.075
56x60	40 in.	3.60	.....yd.	—	@19.229
48x44	40 in.	3.75	.....yd.	—	@18.830

Cotton

The price of middling uplands on the Cotton Exchange has swung in the very wide range of 304 points since our last report (September 7), high for the period being 39.78 on October 2 and low 36.74 on September 10. The average price for middling uplands for the month of September was 37.59, based on 24 trading days. After moving irregularly early in the period, prices turned firmer and moved upward during the last week in September and reached the highest levels in twenty-six years during the first week in October. The early irregularity was influenced on alternate days by the general decline and recovery in the securities market and the belief in the cotton market that the government's second estimate of this year's cotton crop would be sharply lower than the first. When the official forecast was issued and proved to be even lower than had been anticipated, prices moved upward and then leveled off. Opinion on the floor of the Exchange held that caution should be observed around the 40c level, since some resistance from buyers of finished goods was foreseen. Quotations for middling uplands on the Exchange follow:

	Sept. 7	October 14		
	Close	High	Low	Close
December	36.98	38.58	38.37	38.50
March	36.82	38.16	37.99	38.05
May	....	37.71	37.50	37.60

Reclaimed Rubber

No slackening of any kind in the demand for reclaim of all grades has been apparent in recent weeks, with the continued demand stemming from all branches of the industry. Few reclaimers are accepting any export orders, but an occasional shipment is being made abroad to prewar customers. Most reclaimers are now producing synthetic reclaim on a limited factory basis, and carloads of such reclaim are becoming an increasingly familiar sight on railroad sidings. Production is still being maintained at high levels, and the labor situation remains normal. Prices shown below are ceilings on typical grades of reclaim:

Shoe				
Unwashed	lb.	.08	@	.08¼
Tube				
Black Tube	lb.	.12¼	@	.12½
Red Tube	lb.	.13	@	.13¼
Tires				
Black (acid process)	lb.	.08½	@	.08¾
Black, selected tires	lb.	.07½	@	.07¾
Truck, Heavy Gravity....	lb.	.09½	@	.09¾
Miscellaneous				
Mechanical blends	lb.	.05½	@	.06½
White	lb.	.14	@	.14¼

Ducks

Enameling (single filling).....lb.	—	@	69.676
Belting and Hose.....lb.	—	@	67.166
Single filling, A grade.....lb.	—	@	62.474
Double filling, A grade.....lb.	—	@	66.560

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CURRENT MARKET PRICES

Of Rubber Chemicals and Compounding Ingredients

OCTOBER 14, 1946

Prices are, in general, f.o.b. works.
Range of prices indicates grade or quantity variations.
All trade or brand names are set off in quotation marks.
Abbreviations: bbls., barrels; c.l., carlot; l.c.l., less than carlot; dlvd., delivered; t.c., tank cars; min., minimum; dms., drums; cyl., cylinder.
[a] East of Mississippi.

—The arrangement of this section follows closely the Chemical Section of the 1945 RUBBER RED BOOK to which readers are referred to determine the classification of any material or brand name.
—Although suppliers of every material were contacted for price information, only those materials are listed for which quotations have been furnished us. The quotations are not guaranteed and prospective purchasers should contact suppliers for confirmation before placing orders. Suppliers are requested to send us regularly current prices on all of their materials used in the rubber industry.
—All requests for information or listings should be sent to Market Editor, RUBBER AGE, 250 West 57th St., New York 19, N. Y.

ACCELERATORS

"A-1"	lb.	.28	.33
"A-10"	lb.	.36	.42
"A-19"	lb.	.52	.58
"A-77"	lb.	.42	.55
"A-100"	lb.	.42	.55
"Accelerator No. 8" (dlvd.)	lb.	.63	.65
"Accelerator No. 49"	lb.	.40	.42
"Accelerator No. 89" (dlvd.)	lb.	——	1.20
"Accelerator No. 122" (dlvd.)	lb.	——	1.30
"Accelerator No. 552" (dlvd.)	lb.	——	1.63
"Accelerator No. 808" (dlvd.)	lb.	.59	.61
"Accelerator No. 833" (dlvd.)	lb.	1.13	1.15
"Acrin" (dlvd)	lb.	——	.65
"Advan"	lb.	.52	.55
"Altax"	lb.	.39	.41
"Arazate"	lb.	——	1.53
"Beutene"	lb.	.59	.61
"B-J-F"	lb.	.34	.36
"Butasan"	lb.	——	1.10
"Butazate"	lb.	——	1.10
"Butyl Eight"	lb.	.97	.99
"Captax"	lb.	.34	.36
"C-P-B"	lb.	——	1.95
"Cumate"	lb.	——	1.60
"Cuprax"	lb.	.60	.62
"Dibenzo G-M-F"	lb.	——	1.50
"Diesterex-N"	lb.	.50	.52
Diorthotolylguanidine (dlvd.)	lb.	.44	.46
Diphenylguanidine (dlvd.)	lb.	.35	.41
"El-Sixty"	lb.	.36	.43
"Ethasan"	lb.	——	1.10
"Ethazate"	lb.	——	1.10
"Ethyl Tuex"	lb.	——	1.25
Formaniline (dlvd.)	lb.	.36	.37
"G-M-F"	lb.	——	1.95
"Goodrite Erie"	lb.	.60	.62
"Guantal"	lb.	.39	.48
"Hepteen"	lb.	.34	.35
"Base"	lb.	1.25	1.30
"Ledate"	lb.	——	1.20
Mercaptobenzothiazole	lb.	.34	.36
Mercaptobenzothiazyl Disulfide	lb.	.39	.41
"Methasan"	lb.	——	1.20
"Methazate"	lb.	——	1.20
"Monex"	lb.	——	1.25
"Mono-Thiurad"	lb.	——	1.25
"Morfex 33"	lb.	.60	.62
"2-MT" (dlvd.)	lb.	.58	.60
"Namate"	lb.	——	1.00
"Novac"	lb.	——	1.40
"A-13"	lb.	.65	.67
"O-X-A-F"	lb.	.38	.40
"Pentex"	lb.	.74	.77
"Flour"	lb.	.12¼	.12¾
"Phenex" (tons)	lb.	——	.49
"Pipazate"	lb.	——	1.53
"Pip-Pip"	lb.	——	1.63
"R-2 Crystals"	lb.	——	1.55
"Rotax"	lb.	.44	.46
"Safex"	lb.	1.15	1.20
"Santocure"	lb.	.60	.67
"Selazate"	lb.	——	1.60
"Selenac" (Ethyl, Methyl)	lb.	——	1.60
"Setsit-5"	lb.	.75	1.00
"SPDX-G" (tons)	lb.	——	.53
"Tellurac, Ethyl"	lb.	——	1.60
"Tepidone" (dlvd.)	lb.	——	.63
"Tetrone" (dlvd.)	lb.	——	1.25
"A" (dlvd.)	lb.	——	1.85
Thiocarbanilide (dlvd.)	lb.	——	.28
"Thiofide"	lb.	.39	.46
"Thionex" (dlvd.)	lb.	——	1.25
"Thiotax"	lb.	.34	.41
"Thiurad"	lb.	——	1.25
"Thiuram E" (and "M") (dlvd.)	lb.	——	1.25
"Trimene"	lb.	.54	.56
"Base"	lb.	1.03	1.06
Triphenylguanidine (dlvd.)	lb.	——	.45
"Tuads" (Ethyl, Methyl)	lb.	——	1.25
"Tuex"	lb.	——	1.25
"Ulto" (tons)	lb.	——	.99
"L"	lb.	——	1.04
"Ureka"	lb.	.50	.57
"Blend B"	lb.	.50	.57
"C"	lb.	.48	.55
"Vulcanex" (dlvd.)	lb.	.42	.43
"Z-B-X"	lb.	——	2.45
"Zenite" (dlvd.)	lb.	.37	.39
"A" (dlvd.)	lb.	.42	.44
"B" (dlvd.)	lb.	.39	.41
"Zimate" ("Butyl," "Ethyl")	lb.	——	1.10
"Zimate, Methyl"	lb.	——	1.20

ACTIVATORS

Blue Lead, Sublimed (dlvd.)	lb.	.08½	.09
Fish Oil, Hydrogenated, Fatty Acid			
"Hyfac S-52"	lb.	.14⅞	.15⅜[a]
"Neo-Fat H.F.O." (dlvd.)	lb.	.14⅞	.16⅞
"Stearex Beads" (dlvd.)	lb.	.14⅞	.15⅞
Lime, Hydrated			
"Arrowhead"	ton	16.00	19.50
"Sierra"	ton	16.00	19.50
Litharge			
"Eagle" (dlvd.)	lb.	.09¾	.10¾
"FBS" (dlvd.)	lb.	.08	.09¾
Magnesium Oxide, Light			
"Baker's" (Neoprene Grade)	lb.	——	.25
"General Magnesite" (Neoprene Grade)	lb.	——	.25
"General Magnesite" No. 101	lb.	——	.175
"General Magnesite" Standard	lb.	——	.22
"K & M"	lb.	——	.25
"Michigan No. 30"	lb.	——	.22½
"Michigan No. 40"	lb.	——	.25
"Witco Extra Light"	lb.	.25	.27
Magnesium Oxide, Heavy			
"General Magnesite"	lb.	.06	.08
"Michigan No. 15"	lb.	.05	.05½
"Permanente"	lb.	.05	.06½
Oleic Acid (dlvd.)	lb.	.12½	.14¼
"Elaine O-18"	lb.	.12½	.13¾[a]
Palm Oil Fatty Acid (c.l.)	lb.	——	.11
Potassium Oleate (drums)	lb.	——	.29½
Red Lead			
"Eagle" (dlvd.)	lb.	.10¾	.11¾
"No. 2 RM" (dlvd.)	lb.	.09½	.11¼
Sodium Laurate (drums)	lb.	——	.19
Sodium Oleate—Powder (drums)	lb.	——	.35
Paste (drums)	lb.	——	.20
Sodium Stearate—Powder (drums)	lb.	——	.35
USP Grade (drums)	lb.	——	.37
Stearic Acid, Single Pressed			
"S-24"	lb.	.15¾	.15¾[a]
"Stearex B" (dlvd.)	lb.	.15⅜	.16⅜
Stearic Acid, Double Pressed			
"Alba" (dlvd.)	lb.	.18⅝	.21⅛

ACTIVATORS (Cont'd)

"S-2-A" (dlvd.)	lb.	.15⅞	.18⅜
"S-2-B" (dlvd.)	lb.	.15⅜	.16⅜
White Lead Carbonate (dlvd.)	lb.	.09¾	.10¼
Zinc Laurate (c.l.)	lb.	——	.29
"Laurex"	lb.	.14¾	.15¼
Zinc Stearate	lb.	.29	.31
"Aquazine"	lb.	.15	.16
Stearic Acid, Other			
"Hydrex" (c.l., dlvd.)	lb.	——	.14⅞
"Neo-Fat 1-60" (dlvd.)	lb.	——	.15⅞
"Neo-Fat 1-65" (dlvd.)	lb.	——	.18
"Stearite"	cwt.	14.87	15.87

Unclassified Activators

"Activex"	lb.	.20	.22
"Actoflux 1-S"	lb.	.52	.62
"3-S"	lb.	.58	.64
"Aero Ac 50"	lb.	.46	.52
"165"	lb.	.43	.45
"Barak" (dlvd.)	lb.	——	.50
"Bunac K-17"	lb.	.17	.19
"D-B-A"	lb.	——	1.95
"Delac J"	lb.	.50	.55
"P"	lb.	.39	.43
"Dibutylamine No. 117" (l.c.l., dms.)	lb.	——	.69
"Hydrofol Acid No. 51" (dlvd.)	lb.	.1487	.1587
"Palmalene" (drums)	lb.	——	.15
"Polyac" (dlvd.)	lb.	——	1.25
"Ridacto" (drums)	lb.	——	.20
"Snodotte" (dlvd.)	lb.	.1537	.1637
"SOAC" (min. 10 dms.)	cwt.	——	8.00
"Triamylamine No. 180" (l.c.l., drums)	lb.	——	1.01

ANTI-COAGULANTS

Anhydrous Ammonia (l.c.l.)	lb.	.02½	.02¾
"National" (cyl., dlvd.)	lb.	.13	.17
Aqua Ammonia (l.c.l., dms., dlvd.)	lb.	.02½	.02¾
"M.B.M." (l.c.l.)	lb.	——	.35

ANTI-FOAMING AGENTS

"Aero Anti Foam H"	lb.	——	.12
"Regular"	lb.	——	.08½

ANTI-OXIDANTS

"Agerite Alba"	lb.	1.95	2.05
"Gel"	lb.	.52	.54
"Hipar"	lb.	.61	.63
"HP"	lb.	.53	.55
"Powder"	lb.	.40	.42
"Resin"	lb.	.43	.45
"Resin D"	lb.	.40	.42
"Stalite"	lb.	.40	.42
"White"	lb.	1.23	1.33
"Akroflex C" (dlvd.)	lb.	.53	.55
"Albasan"	lb.	.69	.71
"Aminox"	lb.	.40	.42
"Antox" (dlvd.)	lb.	.54	.56
"Aranox"	lb.	——	1.95
Benzoquinone	lb.	1.50	1.75
"Betanox"	lb.	.43	.45
"B-L-E"	lb.	.40	.42
"Powder"	lb.	.61	.63
"B-X-A"	lb.	.43	.45
Carvacrol	lb.	——	.80
Chlorcarvacrol	lb.	——	2.00
"Flectol H"	lb.	.40	.47
"Flexamine"	lb.	.53	.55
Gallic Acid, Tech.	lb.	1.10	1.15
USP or NF	lb.	1.27	1.30
Hydroquinone	lb.	.90	.94
Monomethylparaminophenol sulfate	lb.	2.40	2.90
"Neozone Standard" (dlvd.)	lb.	.61	.63
"A" (dlvd.)	lb.	.40	.42
"C" (dlvd.)	lb.	.43	.45
"D" (dlvd.)	lb.	.40	.42
"D Distilled" (dlvd.)	lb.	.45	.47
"Oxynone"	lb.	.77	.90
"Parazone" (dlvd.)	lb.	——	.68
"Perflectol"	lb.	.53	.60
"Permalux" (dlvd.)	lb.	1.18	1.20
Pyrogallic Acid, Resublimed	lb.	2.60	2.65
USP Crystals	lb.	2.10	2.15
Resorcin, Tech. (dlvd.)	lb.	——	.64
"Santoflex B"	lb.	.40	.47

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"BX"	lb.	.54	- .61
"Santovar O"	lb.	1.15	- 1.40
"Santowhite"	lb.	1.23	- 1.38
"S.C.R." (tons)	lb.	——	- .32
"Solux" (dlvd.)	lb.	1.28	- 1.30
"Stabilite" (tons)	lb.	——	- .48
"Alba" (tons)	lb.	——	- .69
"L" (tons)	lb.	——	- .48
Tannic Acid, Tech.	lb.	.70	- .79
"Thermoflex" (dlvd.)	lb.	1.18	- 1.20
"A" (dlvd.)	lb.	.61	- .63
"C" (d.vd.)	lb.	.54	- .56
Thymol	lb.	——	- 2.50
"V-G-B"	lb.	.43	- .45

ANTI-SCORCHING AGENTS

"Retarder W" (dlvd.)	lb.	——	- .36
Salicylic Acid, Tech.	lb.	——	- .33
"Vultrol"	lb.	.50	- .55

ANTISEPTICS AND GERMICIDES

Formaldehyde (barrels)	lb.	——	- .057
"G-4"	lb.	.95	- 2.50
"G-11"	lb.	3.50	- 5.50
Ortho Cresol	lb.	.17½	- .18
"Soligen Drier"—Copper 8% (drums)	lb.	——	- .17
"Zinc 8%" (dms.)	lb.	——	- .15¾

AROMATICS (DEODORANTS)

"Arolene 1980" (c.l.)	lb.	——	- .10
"2286"	lb.	——	- .25
"2553" (c.l., dms.)	lb.	——	- .13
"Bouquet 149"	lb.	——	- 3.00
Coumarin	lb.	2.75	- 2.90
"Curodex 19"	lb.	——	- 4.75
"183"	lb.	——	- 5.75
"198"	lb.	——	- 6.75
"D-6 Masking Perfume"	lb.	——	- 1.35
"Deodorant 65"	lb.	——	- 1.00
"Deodorant L-37" (25 lbs.)	lb.	——	- 2.15
"L-44" (25 lbs.)	lb.	——	- 2.65
"Latex Perfume 5"	lb.	——	- 3.25
"6"	lb.	——	- 7.50
"9"	lb.	——	- .65
"Neutroleum Delta"	lb.	——	- 2.40
"Gamma"	lb.	——	- 3.40
"Paradora A"	lb.	2.00	- 2.50
"B"	lb.	.65	- 1.00
"C"	lb.	2.75	- 3.25
"D"	lb.	1.50	- 2.00
"E"	lb.	.25	- .55
"Rodo No. 0"	lb.	4.00	- 4.50
"No. 10"	lb.	5.00	- 5.50
"Rubber Perfume 7"	lb.	——	- 9.15
"12"	lb.	——	- 1.90
"Russian Leather 7"	lb.	——	- 4.10
Vanillin	lb.	2.35	- 2.40

BLOWING AGENTS

Ammonium Bicarbonate	lb.	.0564	- .0651
"Blowing Agent No. 15"	lb.	——	- .35
Sodium Bicarbonate, Tech. (c.l., bags)	cwt.	1.70	- 1.78½
"Sponge Paste"	lb.	——	- .20
"Unicel" (dlvd.)	lb.	——	- .50
Urea	ton	68.00	- 85.00

BONDING AGENTS

"Bonding Resin 4162"	lb.	——	- 1.50
"Durez 12987"	lb.	.48	- .53
"Resmite"	gal.	6.75	- 7.25
"Rex Compound 482"	gal.	——	- 1.05
"Ty-Ply Q" (and "S")	gal.	6.75	- 8.75

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	——	- 5.83
Glacial—99½% (bbls.)	cwt.	——	- 9.40
Calcium Nitrate, Tech, Crystals	lb.	.12½	- .15
Hydroxyacetic Acid—70% (dms.)	lb.	——	- .085
Zinc Nitrate, Tech.	lb.	.19½	- .22

COLORING AGENTS

Black

Carbon Black—See *Reinforcing Agents*			
"Lamphlack No. 10"	lb.	.06	- .09
"Mapico Black Iron Oxide" (50 lb. bags)	lb.	.081	- .0835

Blue

"Blue GD, Dispersed" (dlvd.)	lb.	——	- 3.95
"Paste" (dlvd.)	lb.	——	- 1.64
"Blue N" (dlvd.)	lb.	——	- .90
"Blue YD, Dispersed" (dlvd.)	lb.	——	- 1.90
"Monastral Fast Blue CP" (dlvd.)	lb.	——	- 3.50
"PCD, Dispersed" (dlvd.)	lb.	——	- 1.95
"Ramapo Blue"	lb.	3.08	- 3.13
Ultramarine	lb.	.12	- .30

Brown

Brown Iron Oxide	lb.	——	- .10
"Mapico Brown" (50 lb. bags)	lb.	——	- .1135

Green

Green Chromium Oxide, Pure	cwt.	26.00	- 27.50
Green Chromium Oxide, Pure, Hydrated	cwt.	70.00	- 85.00
"Green FD, Dispersed" (dlvd.)	lb.	——	- 1.35
"Monastral Fast Green GSD, Dispersed" (dlvd.)	lb.	——	- 2.85
"GSD Paste" (dlvd.)	lb.	——	- 1.10
"Permansa Green" (dlvd.)	lb.	——	- 1.78
"Pigment Green B"	lb.	1.35	- 1.40
"Ramapo Green"	lb.	3.60	- 3.65
"Utility Green"	lb.	——	- .28

Orange

"Molybdate Orange"	lb.	.31	- .36
"Orange F" (dlvd.)	lb.	——	- 3.05
"FD, Dispersed" (dlvd.)	lb.	——	- 2.35
"OT" (dlvd.)	lb.	——	- 2.75

Purple

Purple Oxide	lb.	——	- .08

Red

Barium Lithol Red	lb.	.60	- .65
Cadmium Red	lb.	.95	- 1.25
Calcium Lithol Red	lb.	.60	- .65
"Graphic Red" (dlvd.)	lb.	——	- .65
Indian Red, Pure	cwt.	9.10	- 10.25
"Jozite"	lb.	.06	- .06¼
"Mapico Red 297" (50 lb. bags)	lb.	.0885	- .096
"Oximony" Iron Oxide	lb.	——	- .09
Red Iron Oxide, Light	cwt.	9.60	- 10.75
"Red PB" (dlvd.)	lb.	——	- 1.65
"PBD, Dispersed" (dlvd.)	lb.	——	- 1.50
"2B" (dlvd.)	lb.	——	- 1.65
"2BD, Dispersed" (dlvd.)	lb.	——	- 1.50
"Rubanox Red" (dlvd.)	lb.	——	- 1.18
"Rubber Red CP-339" dlvd.)	lb.	——	- .97
"Solfast Red CP-663" (dlvd.)	lb.	——	- 1.68
"CP-787" (dlvd.)	lb.	——	- 1.18
"Watchung Red"	lb.	1.65	- 1.70

White—Lithopone

"Albalith"	lb.	.044	- .049
"Astrolith"	lb.	.0440	- .0465
"Cryptone No. 19"	lb.	.05¾	- .06½
"CB No. 21"	lb.	.05¾	- .06½
"Permalith"	lb.	.04¼	- .04½
"Ponolith"	lb.	.044	- .049
"Sunolith"	lb.	.0440	- .0465
"Ti-Tone"	lb.	.0575	- .0625

White—Titanium Pigments

"Raycal"	lb.	.05½	- .05¾
"Rayox"	lb.	.14½	- .16¼
"Titanox A"—all grades (dlvd.)	lb.	.14½	- .15¾
"B-30" (dlvd.)	lb.	.05¾	- .06
"C" (dlvd.)	lb.	.05½	- .05¾
"RA"—all grades (dlvd.)	lb.	.15½	- .16¼
"RC-HT" (dlvd.)	lb.	.05½	- .05¾
"Ti-Bar"	lb.	.05¾	- .06
"Ti-Cal"	lb.	.05½	- .05¾
"Ti-Pure"	lb.	.14½	- .17¼
"Titanolith"	lb.	.05¾	- .06¼
"Zopaque"	lb.	.14½	- .15

White—Zinc Oxide (American Process)

"AZO-ZZZ 11" (and "22, 33, 44, 55") (dlvd.)	lb.	.08	- .08¼[a]
"Eagle" (dlvd.)	lb.	.07¼	- .07½
"Horse Head Special"	lb.	.07¼	- .07¾
"XX Red"	lb.	.07¼	- .07¾
"St. Joe Black Label" (dlvd.)	lb.	.07¼	- .08
"Green Label" (dlvd.)	lb.	.07¼	- .08
"Red Label" (dlvd.)	lb.	.07¼	- .08

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	——	- .12

White—Zinc Oxide (French Process)

"AZO-ZZZ 66"	lb.	.10¼	- .10½[a]
"Kadox 72"	lb.	.07¼	- .07¾
"Black Label"	lb.	.07¼	- .07¾
"Red Label"	lb.	.07¼	- .07¾
"Florence Green Seal"	lb.	.09	- .09½
"Red Seal"	lb.	.08½	- .09
"White Seal"	lb.	.09½	- .10
"U. S. P. 12"	lb.	.10½	- .11

White—Zinc Sulfide

"Cryptone ZS-800"	lb.	.084	- .089

Yellow

Chrome Yellow	lb.	.16	- .21
"Chrome Yellow 12310"	lb.	——	- .18
"Ferrox"	cwt.	——	- 7.38
"Mapico Yellow" (50 lb. bags)	lb.	.0685	- .071
"Oximony" Iron Oxide	lb.	——	- .06¾
"Yellow G" (dlvd.)	lb.	——	- 1.75
"GD, Dispersed" (dlvd.)	lb.	——	- 1.50
"HN" (dlvd.)	lb.	——	- 1.37
Yellow Iron Oxide, Pure	cwt.	7.10	- 8.25

DISPERSING AGENTS

"Agchem SA-19"	lb.	——	- .30
"SA-20"	lb.	——	- .70
"Aquasol-AR 90%"	lb.	——	- .14½
"Darvan No. 1"	lb.	.15½	- .35
"No. 2"	lb.	.19	- .30
"Dispersaid"	lb.	1.25	- 1.35
"Dilex"	lb.	——	- .32
"Halloid"	lb.	.03¾	- .09½
"HornKem No. 1"	gal.	——	- 1.60
"No. 3G"	gal.	——	- 1.75
"No. 12"	lb.	——	- .17
"Marasperse CB"	lb.	.10	- .20
"Penetrol"	lb.	——	- .20
"Plastak"	lb.	.089	- .095
"Ramol PW"	lb.	.18	- .19
"Rubbex"	lb.	.139	- .14¾
"Stan-Chem BQC"	lb.	.12¼	- .17½
"1067"	lb.	——	- .13½
"1471"	lb.	.1687	- .2187
"2251"	lb.	.12¼	- .17¼
Triethanolamine (drums) dlvd.)	lb.	.19	- .20[a]
"Triton R-100"	lb.	.15½	- .25
"Yelkin TT"	lb.	.26	- .35½
"Zinsper"	lb.	——	- .15

EXTENDERS

"Advagum 1098"	lb.	——	- .42
"Bunaweld Polymer No. 780"	lb.	——	- .22
"No. 5514"	lb.	——	- .30
"D-92" (and "D-93") (dms.)	lb.	——	- .12
"Extender 600"	lb.	——	- .13½
"HC-5"	lb.	.08½	- .12
"HC-22"	lb.	.12	- .15
"Multi-Plast MV 60 Emul."	gal.	.32	- .37
"Naftolen MV 60 Emul."	gal.	.60	- .65
"HV 60 Emul."	gal.	.75	- .80
"PR-162 Latex" (dms.)	gal.	1.00	- 1.60
"Synprolac"	lb.	——	- .19
"Synprowax"	lb.	.16	- .19

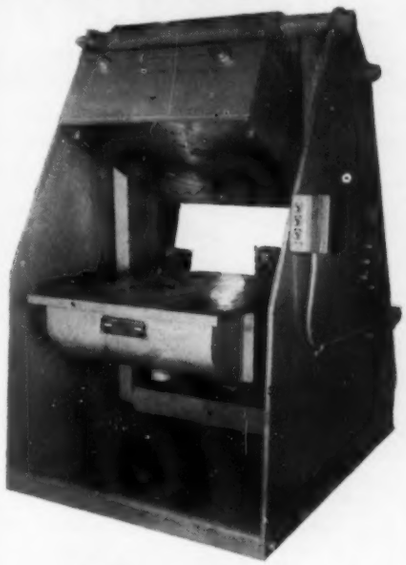
FILLERS (Inert and Reinforcing)

Abrasives			
"Carbonite"	lb.	.15	- .95
"Lionite"	lb.	.09¾	- .90
Aluminum Hydrate	lb.	——	- .14½
Aluminum Silicate			
"Silical"	ton	37.00	- 55.00
Barium Carbonate (l.c.l.)	ton	77.00	- 85.00
Barytes			
No. 1 Floated, White	ton	30.10	- 40.95
No. 2 Floated, Unbleached	ton	28.10	- 38.95
"No. 22 Barytes" (c.l.)	ton	——	- 18.37
"Foam A"	ton	30.10	- 40.95
Off-Color, Domestic (l.c.l.)	ton	29.00	- 32.00
Bentonite (c.l.)	ton	——	- 10.25
Blanc Fixe	ton	60.00	-120.00
Calcium Carbonate			
"Atomite" (c.l.)	ton	——	- 27.50
"B.I. White No. 1" (c.l.)	ton	——	- 7.00
"Calcene T"	ton	37.50	- 47.50
"Camelwhite" (c.l.)	ton	27.50	- 30.00
"Kalite"	ton	26.00	- 52.00
"Kalvan"	ton	100.00	-126.00
"Lesamite" (c.l.)	ton	——	- 27.50
"Lim-Cal" (c.l.)	ton	——	- 12.50
"Millical" (bags)	ton	18.00	- 30.00
"Suprex White"	ton	——	- 32.50
"Suspenso" (bags)	ton	17.00	- 29.00
"Swansdown" (bags)	ton	15.00	- 27.00
"Witcarb R" (c.l.)	ton	——	-100.00
"Witcarb R12" (c.l.)	ton	——	- 32.50
Calcium Silicate			
"Silene EF"	ton	110.00	-120.00
Calcium Sulfate, Anhydrous			
"Snow White Filler"	ton	——	- 16.00
Calcium Sulfate, Hydrous			
"Crysta-Cal" (c.l.)	ton	——	- 12.50
"Terra Alba No. 1"	ton	12.00	- 14.40
Chalk Whiting (l.c.l.)	lb.	.0150	- .0175
"Recco Paris Whiting"	ton	——	- 25.00
Clay			
"Alsite" (c.l.)	ton	——	- 11.00
"Aluminum Flake"	ton	15.00	- 30.00
"A.S.P. No. 1" (c.l.)	ton	——	- 30.00
"No. 11" (c.l.)	ton	——	- 40.00
"Buca" (c.l.)	ton	——	- 44.00
"Catalpo" (c.l.)	ton	——	- 33.00
"Champion"	ton	——	- 12.00
"C.S.D." (c.l.)	ton	——	- 10.00
"Crown"	ton	12.00	- 23.50
"Dixie"	ton	12.00	- 24.50
"Hydratex R"	ton	22.00	- 34.50
"Kaolloid Clay" (c.l.)	ton	——	- 10.00
"Markham"	ton	11.00	- 23.50
"McNamee"	ton	11.00	- 23.50
"Oldham"	ton	11.00	- 23.50
"Paragon"	ton	11.00	- 23.50
"Penna Clay" (c.l.)	ton	——	- 12.00
"Pigment 33" (c.l.)	ton	——	- 35.00
"Recco Clay" (c.l.)	ton	——	- 11.00
"Suprex"	ton	12.00	- 24.50
"Upton"	ton	19.50	- 21.00
"Whitetex" (c.l.)	ton	——	- 50.00
"Witco No. 1" (c.l.)	ton	——	- 12.00
"No. 2" (c.l.)	ton	——	- 12.00
Diatomaceous Earth	ton	30.00	- 50.00
"Kaylorite" (c.l.)	ton	——	- 30.00
Dolomite (c.l.)	ton	——	- 12.50

STANMOCO OIL HYDRAULIC VULCANIZING PRESSES

For mechanical rubber and plastic articles. Combination oil hydraulic and toggles with platen pressure of 200 tons. Platens 34" x 34" with daylight opening 14½". May be adjusted for slight variation of mold thickness. Simple in construction and easy to lubricate and maintain. Easily controlled.

Write for complete details.



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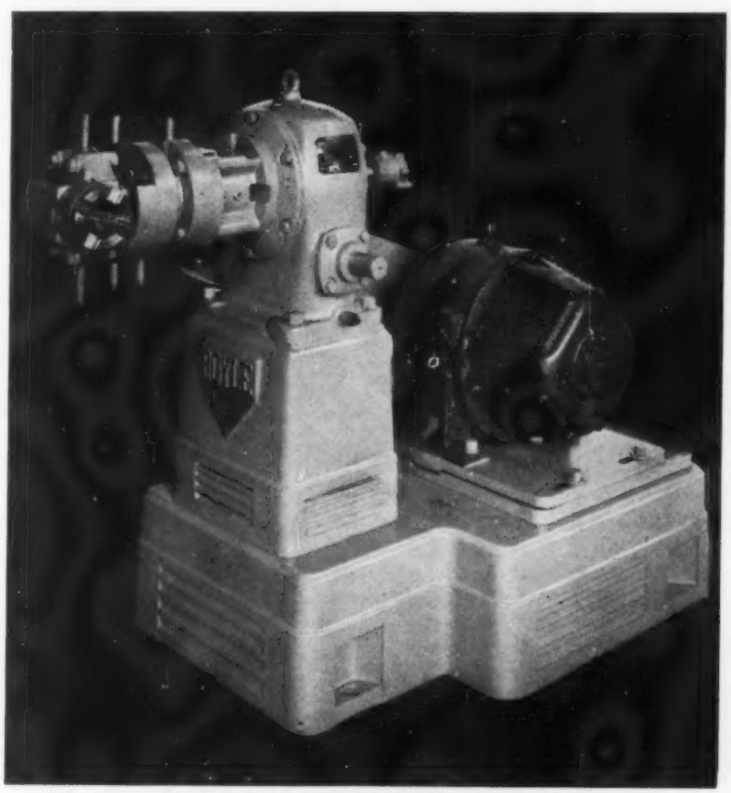
The Akron Standard Mold Co.

Akron "The Established Measure of Value" Ohio



NO. 1 ROYLE CONTINUOUS EXTRUDER

Designed for Experimental and Product Extruding

Rugged is the word to describe this compact and highly efficient Royle continuous extruding machine. It embraces all of the characteristics required for larger and heavier extruding processes.

Primarily designed to become an integral part of laboratory equipment—the technician can be sure that his experiments will have a true relation to actual product extruding—the Royle #1 is an efficient producer of such commercial products as tubes, fine wire insulation, monofilament, and thread coating.

JOHN ROYLE & SONS

Pioneered the Continuous Extrusion Process in 1880

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James Day (Machinery) Ltd., London, England—REgent 2430. Home Office: B. H. Davis—J. W. VanRipen—SHerwood 2-8262. Akron, Ohio; J. C. Clinefelter—UNiversity 3726. Los Angeles, Cal.: H. M. Royal, Inc.—LAfayette 2161.

FILLERS (Cont'd)

Flock			
Cotton	lb.	.08½ -	.20
"Filfloc F 40-9000"	lb.	— -	.10½
"Filfloc F 6000"	lb.	— -	.16
Rayon, bleached or dyed	lb.	.85 -	1.50
Rayon, grey	lb.	.10 -	.12
"Solka-Floc" (l.c.l.)	lb.	.06 -	.12
Wool, bleached or dyed	lb.	.70 -	1.00
Glue, Bone (dlvd.)	lb.	.16½ -	.18½
Ground Glass (l.c.l.)	lb.	.04 -	.06
Leather, Shredded	lb.	.05 -	.17
Lignin	lb.	.03 -	.06
"Indulin"	lb.	— -	.09
Limestone, Pulverized	ton	3.25 -	10.00
"Micro Velva"	ton	30.00 -	32.00
"Velvet Filler, Regular"	ton	16.00 -	18.00
Magnesium Carbonate	lb.	.06¼ -	.08¼
"Clearcarb"	lb.	.09 -	.09½
"K & M"	lb.	.06¼ -	.07¼
Magnesium Silicate	ton	18.00 -	35.00
"Airex"	ton	22.50 -	23.50
"Asbestol"	ton	17.00 -	25.00
"L.S. Silver"	ton	22.50 -	23.50
"Sierra White"	ton	19.50 -	21.00
Mica	lb.	.03 -	.07
"Concord"	lb.	.05¾ -	.06¼
"Micro-Mica"	lb.	.06½ -	.07
"Mineralite" (c.l.)	ton	30.00 -	40.00
"Silversheen"	lb.	.05¾ -	.06¼
"Triple A Mica" (c.l.)	ton	— -	25.00
"Wet Ground Mica No. 160"	lb.	.05¼ -	.06¼
Pumice	lb.	.03 -	.05
Pyrophyllite			
"Pyrax"	ton	10.50 -	25.00
Silica	ton	16.00 -	27.00
Slate, Powdered (l.c.l.)	ton	15.00 -	30.00
Talc, Domestic	ton	9.00 -	20.00
Whiting, Commercial	ton	8.00 -	20.00
"Cameline" (c.l.)	ton	8.50 -	10.00
"C-C-O White"	ton	— -	14.50
"Keystone" (c.l.)	ton	— -	14.00
"Snowflake" (c.l.)	ton	— -	16.00
"Veroc" (c.l.)	ton	— -	7.50
"York White" (c.l.)	ton	— -	8.00
Wood Flour	ton	25.00 -	50.00

FINISHING MATERIALS, SURFACE

Shellac, Orange Gum	lb.	.70 -	.95
"VanWax"	gal.	1.25 -	1.30

FLAME RETARDANTS

Chlorinated Paraffin	lb.	.10 -	.25
"Zinc Borate 3167"	lb.	.12 -	.16¾
"Zyrox"	lb.	.35 -	.45

LUBRICANTS, MOLD

"Aquadag"	lb.	3.15 -	3.45
"Aquarex L Paste" (dlvd.)	lb.	— -	.85
"MDL Paste" (dlvd.)	lb.	— -	.25
Borax, Granular (l.c.l.)	ton	56.00 -	61.00
"Colite Concentrate" (dms.)	gal.	— -	.90
"Concentrex"	lb.	— -	.20
"Dipex"	lb.	.11 -	.13
"M"	lb.	.13 -	.15
"Dri-Lube"	lb.	— -	.18
"Glycerized Lubricant"	gal.	— -	1.50
"Glydag"	lb.	1.30 -	2.00
"G.T.M.C. Solution"	lb.	1.05 -	1.35
"Kokobace"	lb.	— -	.12
"Latex-Lube"	lb.	.16¾ -	.18¾
"Liqui-Lube"	gal.	1.45 -	1.85
"Lubrex"	lb.	.25 -	.30
"Migralube"	lb.	— -	.30
"Moldex"	lb.	— -	.12½
"Moldeze No. 1"	gal.	— -	36.00
"No. 2"	gal.	— -	12.00
"No. 3"	gal.	— -	12.00
"Mold-Slick"	lb.	.202 -	.215
"Orvus WA Paste" (dms.)	lb.	— -	.25
"Prodag"	lb.	.25 -	.38
"Redotex Flakes" (dlvd.)	lb.	.13⅞ -	.15⅛
"Powder" (dlvd.)	lb.	.14¼ -	.15½
"Rubber-Flo"	gal.	— -	1.00
"Rubber-Glo"	gal.	— -	.94
"Rusco Mold Paste"	lb.	.12 -	.18
"Sericite" (l.c.l.)	ton	65.00 -	75.00
"Ulco Mold Soap"	lb.	.10 -	.18
"Werkrite Flakes" (dlvd.)	lb.	.11¾ -	.13
"Powder" (dlvd.)	lb.	.12⅛ -	.13⅛

LUBRICANTS, RUBBER

Lithium Stearate	lb.	— -	.50
Propylene Stearate (drums)	lb.	— -	.40
"Rubberol"	lb.	— -	.18½

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.31 -	.32
Calcium Stearate	lb.	.25 -	.27
"Orel"	gal.	1.85 -	2.00
Polyethylene Glycol	lb.	.25 -	.26
"Rexanol A"	lb.	— -	.11
"Separex A"	lb.	— -	.15

MOLD CLEANERS

"Actusol"	lb.	.13½ -	.15½
"Metso 99"	cwt.	3.05 -	4.45
"Granular"	cwt.	2.50 -	3.55
"Rubber-Sol"	gal.	— -	1.89
Sodium Silicate	cwt.	.80 -	1.40
"Sprex A.C."	gal.	1.45 -	1.85

PEPTIZING AGENTS

Carbothermic Magnesia	lb.	— -	.13½
"Peptizer P-12"	lb.	.75 -	.83

PLASTICIZERS & SOFTENERS

"AA" (drums)	lb.	— -	.13¾
"Acto 500"	lb.	— -	.09
"Adipol BCA" (dms.)	lb.	— -	.40
"Amalgamator Z-4"	lb.	— -	.30
"American" Pine Tar	gal.	.25 -	.38⅛
"Bardex" (l.c.l.)	lb.	— -	.04½
"Bardol"	lb.	.02½ -	.02¾
"B" (l.c.l.)	lb.	— -	.05¼
"Bayol D"	gal.	.25 -	.26
"F"	gal.	.37 -	.40
Beeswax, Refined & Bleached	lb.	.60½ -	.70
Yellow Refined	lb.	.54 -	.62
"Bondogen"	lb.	.55 -	.85
"B.R.C. No. 20"	lb.	.0105 -	.0115
"B.R.H. 2"	lb.	.02 -	.021
"B.R.T. 3"	lb.	.0175 -	.0185
"4"	lb.	.019 -	.02
"7"	lb.	.02 -	.021
"B.R.V."	lb.	.035 -	.0375
"Bunarex"	lb.	.053 -	.0625
"Bunatak M"	lb.	— -	.20
"O"	lb.	— -	.18
"R"	lb.	— -	.14
"U"	lb.	— -	.15
"No. 21"	lb.	— -	.08
"No. 90"	lb.	— -	.08
"No. 865"	lb.	— -	.17
"No. 1080"	lb.	— -	.09½
Burgundy Pitch	lb.	— -	.10
"Butac"	lb.	.1101 -	.1476
Butyl Benzyl Sebacate	lb.	.75 -	.77½
Butyl Palmitate	lb.	— -	.26¾
Butyl Roleate	lb.	.16 -	.18
"BWH-1"	lb.	— -	.10
"Campol" (t.c.)	ton	— -	42.00
Candelilla Wax, Prime	lb.	.78 -	.85
"Carbonex"	lb.	.0295 -	.03¼
"S"	lb.	.03 -	.03½
"S Plastic"	lb.	.0285 -	.0335
"Carbowax 4000" (drums)	lb.	.29 -	.30
"Cardolite 615"	lb.	.32 -	.35
"816"	lb.	.20 -	.23
"5858"	lb.	.42 -	.46
Carnauba Wax, Crude	lb.	1.30 -	1.77
Refined	lb.	1.85 -	1.90
Substitute	lb.	.45 -	1.08
Yellow	lb.	2.00 -	2.05
"Celluflex 142" (and "179"), (drums)	lb.	— -	.31½
Ceresin Wax	lb.	.15 -	.25
"Contogum"	lb.	.06¾ -	.10¼
"Cumar Resins"	lb.	.05¼ -	.11¾
"Darex Copolymer X11"	lb.	.40 -	.50
"X54"	lb.	.42 -	.60
"D.B.M."	lb.	— -	.30
Degras, Common	lb.	.10 -	.14
Diamylphenol (l.c.l., drums)	lb.	— -	.21
Dibenzyl Ether (drums)	lb.	— -	.40
Dibenzyl Sebacate	lb.	.66 -	.70½
Dibutyl Phthalate	lb.	.20 -	.20½
Dibutyl Sebacate—Tech.	lb.	.49 -	.51½
C.P.	lb.	.51 -	.53½
Dicapryl Phthalate	lb.	.24½ -	.27
Di-carbitol Phthalate (l.c.l., drums)	lb.	— -	.35
"Dielex"	lb.	.05½ -	.06
Diethyl Phthalate (t.c.)	lb.	— -	.20½
Dihexyl Sebacate	lb.	.47 -	.49½
Dimethyl Phthalate	lb.	.19 -	.20½
Dimethyl Sebacate	lb.	.65 -	.67½
"Dinopol" (dms., dlvd.)	lb.	.35½ -	.36
Dioctyl Phthalate (drums, dlvd.)	lb.	.35½ -	.36
Dioctyl Sebacate	lb.	.53 -	.55½
"Dipolymer Oil"	gal.	.33 -	.38
"Dispersing Oil No. 10" (l.c.l.)	lb.	— -	.04
"Dutrex A" ("B," "5," "6")	lb.	.02½ -	.03¾
"15E"	gal.	.10 -	.15
"20," "21," "25"	lb.	.025 -	.0435
"Dyal 89"	lb.	— -	.45
"Econo-Plast" (drums)	lb.	.03¼ -	.03¾
"ELA" (dlvd.)	lb.	— -	.80
"Estac"	lb.	— -	.14½
"Ethox" (l.c.l., drums)	lb.	— -	.3065
"Flexol DOP" (dlvd.)	lb.	.34½ -	.36
"Flexol 3GH" (dms., dlvd.)	lb.	.55 -	.56
"3GO" (dlvd.)	lb.	.51½ -	.53½
"4GO" (dlvd.)	lb.	.38 -	.40
"H-70"	lb.	.56¾ -	.64½
"Hercolyn" (dlvd.)	lb.	.12 -	.16
"Herco-H.T."	gal.	.17 -	.22
"Herco-Plas"	lb.	— -	.03
"Herco-Wax"	lb.	— -	.03½
"HT-300"	lb.	.45¾ -	.53
"Indonex 633½" ("634½, 638½, 639½")	gal.	.14 -	.16
"Indopol H-300"	gal.	1.27 -	1.31
"JMH"	lb.	— -	.65
"Kapsol" (l.c.l., drums)	lb.	— -	.29
"KP 23" (dms.)	lb.	— -	.29
"120" (dms.)	lb.	— -	.39
"140" (dms.)	lb.	— -	.45
"150" (dms.)	lb.	— -	.29
"201" (dms.)	lb.	— -	.42
"Kronisol" (drums)	lb.	.297 -	.3065
"Kronitex" (drums)	lb.	.25½ -	.26½[a]
Lanolin, Tech., Anhydrous	lb.	.20 -	.30
Lead Oleate	lb.	.16½ -	.19¾
"Lindol" (drums)	lb.	— -	.25½

PLASTICIZERS & SOFTENERS (Cont'd)

2-Mercaptoethanol (drums)	lb.	— -	.75
"Methox" (l.c.l., drums)	lb.	— -	.3065
Methyl Oleate	lb.	— -	.20
Methyl Stearate	lb.	— -	.34
"Montan Substitute No. 506"	lb.	.425 -	.435
"Monten Wax" (c.l.)	lb.	— -	.12
"Monoplex 35"	lb.	.20 -	.21
"36"	lb.	.30 -	.31
"Multi-Plast" (drums)	lb.	.04¼ -	.04¾
"Naftolen HV" (and "R-100") (drums)	lb.	.11 -	.12
"LV" and "MV" (drums)	lb.	.05¼ -	.05¾
"Nerium"	lb.	— -	.09
"Nevillac Resins" (drums)	lb.	.17 -	.50
"Neville Resins" (drums)	lb.	.08½ -	.14¾
"Nevindene Resins" (drums)	lb.	.10½ -	.13½
"Nevinol" (drums)	lb.	— -	.13
"Nevoll"	lb.	.02 -	.02½
"Nevtex 10" (drums)	lb.	— -	.08
"90" (drums)	lb.	— -	.20
"Nuba 1" (and "2") (drums)	lb.	— -	.029
"3X" (drums)	lb.	— -	.04¾
"15 (and 30) Oil" (drums)	lb.	— -	.17¼
"781 Oil" (drums)	lb.	— -	.22
"No. 480 Oil Proof Resin"	lb.	.14 -	.14½
"Opalwax"	lb.	.22 -	.23
Ortho-Nitrobiphenyl	lb.	.06 -	.11
"Ozokerite Wax No. 64 White"	lb.	.31 -	.32
"Yellow"	lb.	.25 -	.26
"P-1" (and "4, 6, 8, 20") (drums)	lb.	.26½ -	.33
"P-75"	lb.	.66 -	.72
"Pale 4" (and "1000") (drums)	lb.	— -	.17¼
Palm Oil	lb.	— -	.11
"Paradene Resins" (drums)	lb.	.05¼ -	.06¼
"Para Flux" (drums)	gal.	— -	.19
"2016" (l.c.l.)	gal.	— -	.20
"Para Lube" (l.c.l.)	lb.	— -	.048
"Paraplex G-25"	lb.	.69 -	.70
"G-40"	lb.	.47 -	.48
"Parmo"	lb.	.04½ -	.12½
"Paroil 143"	lb.	— -	.09¾
"170, Powdered"	lb.	— -	.18
"Pentalene 90" (l.c.l., dms.)	lb.	— -	.17
"92" (l.c.l., drums)	lb.	— -	.25
"Pentaphen No. 114" (l.c.l., bags)	lb.	— -	.23
"Pepton 22"	lb.	.70 -	.75
"PG-16" (drums)	lb.	— -	.34
"Picco 10" (and "25")	lb.	— -	.083
"75" (and "100")	lb.	— -	.09
"S.O.S."	gal.	.29 -	.34
"Piccocizer 30"	lb.	.05½ -	.06
"D"	lb.	— -	.10
"Piccolastic A" (and "B, C, D, E")	lb.	.20 -	.20⅛
"F"	lb.	.12½ -	.13
"Piccolyte S Resins"	lb.	.15 -	.18½
"Piccoumaron Resins"	lb.	.06¼ -	.10¾
"Piccovar"	lb.	.10 -	.12½
"Piccovol"	lb.	.02 -	.02¾
"Pictar"	gal.	.18 -	.23
"Plas-Blend 360"	lb.	.02½ -	.03
"Plastac M"	lb.	.08¾ -	.09¼
"Plasticizer 3"	lb.	.12 -	.14
"Plasticizer No. 7-2"	lb.	— -	.60
"No. 11-2"	lb.	— -	.32
"Plasticizer No. 1889"	lb.	— -	.565
"No. 1919"	lb.	— -	.52
"No. 2069" (l.c.l.)	gal.	— -	.23
"No. 2070" (l.c.l.)	gal.	— -	.27
"Plasticizer SC"	lb.	— -	.50
"Plasticizer VA-1"	lb.	.33 -	.35
"Plastoflex 50"	lb.	.28 -	.29
"Plastogen"	lb.	.07¾ -	.12
"Plastolein X-55" (dms.)	lb.	— -	.42
"X-148" (dms.)	lb.	— -	.45
"Plastone"	lb.	.27 -	.30
"Polymel Liquid"	gal.	.12 -	.17
"Polymel Resins"	lb.	.02½ -	.05½
"PT 101" ("400, 600, 800") (c.l., drums)	gal.	— -	.31
"Refrigerator Oil 145-R"	gal.	— -	1.25
"Reogen"	lb.	.11½ -	.15
"465 Resin" (drums)	lb.	— -	.03½
"Resin 731"	lb.	— -	.10½
"Resin C"	lb.	.015 -	.016
"Resinex"	lb.	.02½ -	.03
"Ridbo 369" (drums)	lb.	.08 -	.09
"369-F" (drums)	lb.	— -	.12
"Rosin Oil"	gal.	.45 -	.70
"R.P.A. No. 2" (dlvd.)	lb.	— -	.65
"No. 4" (dlvd.)	lb.	— -	.80
"No. 5" (dlvd.)	lb.	— -	.57
"R.S.N. Flux"	gal.	.10 -	.19
"R.S.O. Softening Oil"	lb.	.02½ -	.03
"Rubtar"	gal.	— -	.40
"Santicizer B-16"	lb.	.32 -	.36
"E-15"	lb.	.34 -	.38
"M-17"	lb.	.35½ -	.39
"No. 140"	lb.	.25 -	.35½
"Softener No. 20"	gal.	.09 -	.25
"S.P.C."	lb.	— -	.19½
"S.R.O."	lb.	.02 -	.02¼
"Stanolind Petrolatum"	lb.	.032 -	.069
"Wax"	lb.	.25 -	.30
"Staybelite Resin" (dms.)	lb.	— -	.09
"Sunny South" Pine Tar	gal.	.25 -	.38⅛
"Superla Wax"	lb.	.23 -	.28
"Syncera Wax"	lb.	.16 -	.21
"Synplasticizer"	lb.	— -	.10
"Syn Tac" (c.l.)	gal.	— -	.33

New Stock Cooling Rack

THIS New Rack offers a convenient method for storing materials that require cooling or air drying.

- Rack can be either stationary or mounted on casters.
- Trays have perforated metal surface and can be spaced to suit.
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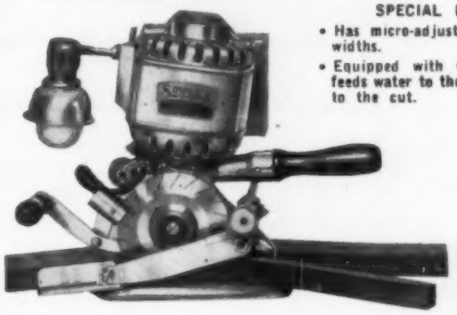
A PORTABLE machine capable of stripping slab rubber up to 1" thick at the rate of 20,000 feet in 8 hours. Any width desired.



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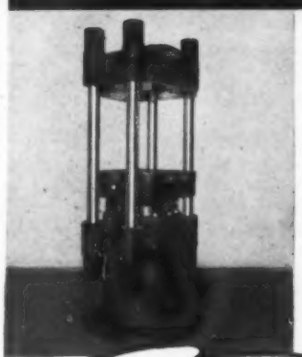

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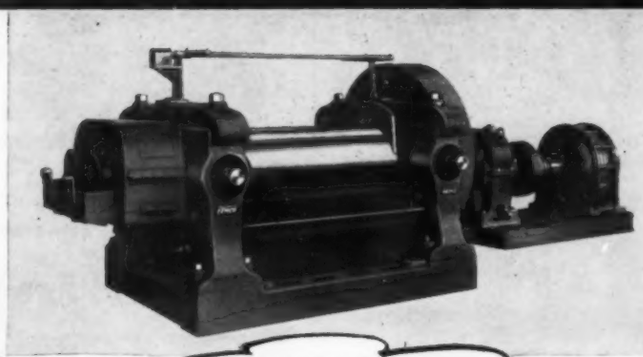

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PLASTICIZERS & SOFTENERS (Cont'd)

"Synthol"	lb.	——	.22½
Tar, Refined	gal.	.10	.15
"K-Tarnel NR" (t.c.)	lb.	——	.0851
"Terpene A"	gal.	——	.65
"Thiokol TP-90 B" (and "TP-95"	lb.	.55	.65
Triacetin	lb.	.34	.45
Tricresyl Phosphate	lb.	.24	.25½
Triphenyl Phosphate	lb.	.26	.27
"Turgum S"	lb.	.0926	.1126
"Vanadiset A" (to "F")	lb.	.0165	.05
"Pulverized"	lb.	.08½	.21
"Solution"	gal.	.40	.65
"Vistac No. 1"	gal.	——	1.31
"No. 2"	gal.	——	1.65
"No. 4"	gal.	——	1.79
"Witresin" Granular	ton	50.00	60.00
"Witresin" Solid	ton	40.00	50.00

PROCESSING AIDS

Castor Oil, Processed (dms.)	lb.	——	.17¼
Refined (drums)	lb.	——	.15¾
"Castorwax" (min. 400 lbs.)	lb.	——	.25
"Dutrex 7"	lb.	.02½	.03¼
"30"	gal.	.24	.27
"Resin No. 510"	lb.	——	.16
"Wilmac D-X"	lb.	.09	.10

PROTECTIVE & STABILIZING AGENTS

"Agchem SA-9" (to "SA-12")	lb.	.65	1.02
"Aroostoocrat"	lb.	——	.07½
Acacia	lb.	.12½	.21
Carob Bean Flour	lb.	.45	.60
Casein	lb.	.24	.24¼
Ethylene Diamine 68%	lb.	.57	.58
Karaya Gum	lb.	.19	.45
"Rex Compound No. 2801"	lb.	——	.15
Sodium Alginate	lb.	——	1.50
"Stablex B"	lb.	——	.95
Starch, Corn, Processed	lb.	——	.0795
Tragacanth	lb.	.30	1.00

RECLAIMING AGENTS

"1-D Heavy Oil" (drums)	lb.	——	.04
"No. 517 H.B. Oil"	gal.	.11½	.16½
"C-6 Oil" (and "C-6-A, C-28")	gal.	.33	.38
"C-10 Oil" (and "C-33")	gal.	.19	.24
Caustic Soda—Flake 76% (c.l., drums)	cwt.	——	3.09¼
Liquid 50% (t.c.)	cwt.	——	2.04¼
Solid 76% (c.l., drums)	cwt.	——	2.41½
Cresylic Acid	gal.	.75	.83
"D-4"	gal.	.17	.22
"E-5"	gal.	.15	.20
"LX-83 Reclaiming Solvent"	gal.	.13	.23
"LX-572 Reclaiming Oil"	gal.	.20	.28
"Reclaiming Oil 1621"	lb.	——	.0235
"Reclaiming Reagent No. 3"	lb.	.12	.15
"R.P.A. No. 3" (dlvd.)	lb.	——	.46
Soda Ash (c.l., bags)	cwt.	——	1.10¼
"Solvent 534"	gal.	.22	.27
"Solvent Oil 21"	gal.	——	.24
"Wilcor Reclaiming Oil No. 111" (drums)	gal.	.26	.30
"No. 151" (drums)	gal.	.26	.30
"X-1 Resinous Oil"	lb.	.011	.01¢
"X-60 Solvent"	gal.	.20	.28

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

"Atlantic HPC-98"	lb.	.05¾	.102
"Continental F"	lb.	.05¾	.102
"Croflex"	lb.	.05¾	.102
"Crow"	lb.	.05¾	.102
"Dixiedensed" (and "S," "66")	lb.	.05¾	.102
"Kosmobile" (and "S," "66")	lb.	.05¾	.102
"Kosmos T"	lb.	.05¾	.102
"Spheron 4"	lb.	.05¾	.102
"Witco Disperso No. 6"	lb.	.05¾	.102

Channel, Medium Processing (MPC) (bags)

"Atlantic MPC-95"	lb.	.05¾	.102
"Colloidal Micronex" (dms.)	lb.	.07¼	.08¼
"Continental A"	lb.	.05¾	.102
"Croflex TH"	lb.	.05¾	.102
"Dixie R-1"	lb.	.05¾	.102
"Dixiedensed HM" (and "S-66")	lb.	.05¾	.102
"Huber TX"	lb.	.05¾	.102
"Kosmobile HM" (and "S-66, SMG")	lb.	.05¾	.102
"Kosmos M"	lb.	.05¾	.102
"Micronex Standard"	lb.	.05¾	.097
"Spheron 6"	lb.	.05¾	.102
"Witco Disperso No. 1"	lb.	.05¾	.102

Channel, Easy Processing (EPC) (bags)

"Atlantic EPC E-42"	lb.	.05¾	.102
"Collocarb"	lb.	——	.065
"Continental AA"	lb.	.05¾	.102
"Croflex 77"	lb.	.05¾	.102
"Dixiedensed 77"	lb.	.05¾	.102
"Kosmobile 77"	lb.	.05¾	.102
"Micronex W-6"	lb.	.05¾	.097
"Spheron 9"	lb.	.05¾	.102
"Witco Disperso No. 12"	lb.	.05¾	.102
"Wyex"	lb.	.05¾	.102

Channel, Conductive (CC) (bags)

"Dixie 5"	lb.	.05825-	.107
"Kosmink"	lb.	.05825-	.107
"Spheron C"	lb.	.08	.12½
"I"	lb.	.066	.111
"N"	lb.	.18½	.25
"Voltex"	lb.	.15	.18½

Furnace, High Elongation (HFF) (bags)

"Sterling K"	lb.	.05	.07¾

Furnace, High Modulus (HMF) (bags)

"Continex HMF"	lb.	.05	.07½
"Croflex 40"	lb.	.05	.07½
"Dixie 40"	lb.	.05	.07½
"Kosmos 40"	lb.	.05	.07½
"Modulex"	lb.	.05	.07½
"Philblack A"	lb.	.05	.06
"Statex 93"	lb.	.05	.06½
"Sterling L"	lb.	.05	.07½

Furnace, Semi-Reinforcing (SRF) (bags)

"Colloidal Black Dispersion 33" (drums)	lb.	.12¾	.13¾
"Continex SRF"	lb.	.03½	.05½
"Croflex 20"	lb.	.03½	.05½
"Dixie 20"	lb.	.03½	.05½
"Essex"	lb.	.03½	.05½
"Furnex"	lb.	.03½	.05½
"Gastex"	lb.	.03½	.06
"Kosmos 20"	lb.	.03½	.05½
"Pelletex"	lb.	.03½	.06
"Seminex"	lb.	.03½	.05½
"Sterling R"	lb.	.03½	.05½
"Sterling S"	lb.	.03½	.05½

Furnace, Fine (FF) (bags)

"Statex B"	lb.	.05¼	.08½

Thermal, Fine (FT) (bags)

"P-33"	lb.	.04½	.07

Thermal, Medium (MT) (bags)

"Thermax"	lb.	.02¾	.05½

REINFORCING AGENTS—MISCELLANEOUS

"Darax Copolymer No. 2" (and "No. 3")	lb.	——	.46
"Durez 12687" (and "12707")	lb.	.27½	.29
"Marbon B" (and "S, S-1")	lb.	.52	.65
"Marmix"	gal.	1.35	1.75
"Naftex SRF"	lb.	.04¾	.06½
"HMF"	lb.	.05¾	.07¾
"EPC"	lb.	.07	.09½
"Wilcorite R Resins"	lb.	.27½	.29

RETARDERS

"E-S-E-N"	lb.	.34	.36
"Retardex" (tons)	lb.	——	.445

RUBBER SUBSTITUTES

Mineral Rubber

"38"	ton	26.00	32.50
"Black Diamond"	ton	26.00	27.50
"Byerlyte"	ton	32.50	45.00
Gilsonite, Selects (c.l.)	ton	30.50	32.90
"Hard Hydrocarbon"	ton	28.50	30.50
Mineral Rubber, Granulated	ton	25.00	27.50
Solid	ton	20.00	22.50
"Parmr" (drums)	ton	26.00	30.00
"Pioneer"	ton	32.50	50.00

Vulcanized Vegetable Oils (Factice)

"Amberex"	lb.	.19	.20½
Brown	lb.	.10	.19
Dispersed	lb.	.17¼	.30¼
"Neophax"	lb.	.15½	.19
White	lb.	.09	.18½

Miscellaneous Rubber Substitutes

"Gilsowax"	lb.	.04½	.05
"Insulac W"	lb.	.05½	.06
"Resin No. 1098" (drums)	lb.	——	.42
"No. 1198"	lb.	.31	.35
"Wilmex M-4" (and "M-6")	lb.	.05½	.06

SOLVENTS

Acetone (dlvd.)	lb.	.07	.08½
"American" Dipentene (t.c.)	gal.	——	.49
"Amsco" Lactol Spirits (t.c.)	gal.	——	.12
"Rubber Solvent" (t.c.)	gal.	——	.11½
"Solv A" (t.c.)	gal.	——	.16
"Solv B" (t.c.)	gal.	——	.18
"Special Napthalite" (t.c.)	gal.	——	.11½
"Textile Spirits" (t.c.)	gal.	——	.12
Amyl Chlorides, Mixed (l.c.l.) (drums)	lb.	——	.08
Benzol 90%	gal.	——	.21
Butyl Acetate (t.c.)	lb.	.18	.198
Butyl Alcohol (t.c.)	lb.	.18½	.206
Secondary (dlvd.)	lb.	.08½	.10
Tertiary (dlvd.)	lb.	.11	.13
Carbon Bisulfide, Tech.	lb.	.05¾	.08
Carbon Tetrachloride	gal.	——	.80
Cyclohexane	lb.	.11	.11½
Cyclohexanone	lb.	.30	.30½
Diacetone, Pure (dlvd.)	lb.	.10½	.12
Dichlorethyl Ether (drums)	lb.	.16	.17
Formal (drums)	lb.	.26	.27
Dichloropentane (t.c.l., (drums)	lb.	——	.04½
"Dipentene 122" (dms.)	gal.	.56	.58
Ethyl Alcohol (t.c.)	gal.	.53½	.55½
Ethylene Dichloride (drums, dlvd.)	lb.	.07½	.08
Heptanes (t.c.)	gal.	——	.15
Hexanes (t.c.)	gal.	——	.15¾
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.37½	.47
Ether, Ref. (dlvd.)	lb.	.04½	.06½
Mesityl Oxide (dlvd.)	lb.	.10½	.12
Methanol	gal.	.36	.43
Methyl Acetone, Syn. (drums, dlvd.)	gal.	.46	.52
Methyl n-Amyl Ketone (drums)	lb.	.29	.30
Methyl Ethyl Ketone (dlvd.)	lb.	.08	.09½
Methyl Isobutyl Ketone (dlvd.)	lb.	.10½	.12
"N-5" Pentane Mix. (t.c.)	gal.	——	.06½
"N-6" Hexanes (t.c.)	gal.	——	.10¾
"N-7" Heptanes (t.c.)	gal.	——	.09½
"Nevsol"	gal.	.21½	.28
"Petrolene" (t.c.)	gal.	——	.08¾
Picolines, Alpha, Refined	lb.	.23½	.24½
Mixed	lb.	.24	.25
Pyridine, Refined	lb.	.44	.45
Quinoline	lb.	.24½	.25½
"Rubsol" (t.c.)	gal.	——	.07⅛
"Skellysolve B" (Hexanes) (t.c.)	gal.	——	.10½
"C" (Heptanes) (t.c.)	gal.	——	.10
"E" (Octanes) (t.c.)	gal.	——	.129
"R" (Solvent Naphtha) (t.c.)	gal.	——	.081
"Solvenol"	gal.	.49	.58
Solvent, Crude, Light	gal.	.27	.30
"Sunny South" Dipentene (t.c.)	gal.	——	.49
"Tollac"	gal.	.23	.28
Toluene (drums)	gal.	——	.27
Trichlorethane	lb.	.11	.12
Triglycol Dichloride (drums)	lb.	——	.49
"Tromex"	lb.	.078	.083
"X-7" Sp. Heptanes (t.c.)	gal.	——	.09
"X-8-A Solvent Naphtha"	gal.	——	.07⅛
Xylene (drums)	gal.	——	.27

STABILIZING AGENTS (for Vinyl Resins)

Lead Stearate	lb.	——	.30
"Stabilizer V-1-N"	lb.	.44	.50
"Vanstay"	lb.	.38	.50

SUN CHECKING AGENTS

"Antisol"	lb.	.23	.24
"Heliozone" (dlvd.)	lb.	.23	.24
"Sunproof"	lb.	.22¾	.23¾
"Jr."	lb.	.16¼	.17¼
"Tonox"	lb.	.50	.52

TACKIFIERS

"Advaresin 100"	lb.	.11	.11½
"Amberol ST-137X"	lb.	.32	.32½
"Agchem RC 30"	gal.	.65	1.34
"Beckopol 1400"	lb.	.24	.25
"Bunaweld 780"	lb.	——	.22
"5514"	lb.	——	.30
"Dutrex 44"	lb.	——	.11
"E-310 Resin Emulsion"	lb.	——	.14
"Galex"	lb.	.11	.21
"Koresin"	lb.	.40	.52
"Lindol Emulsion" (drums)	lb.	——	.27
"Liquid Rubber Flux"	lb.	——	.11
"Nevilloid C-55" (drums)	lb.	——	.12
"Pentacizer 344"	lb.	——	.20
"Pentalyn Resins" (dlvd.)	lb.	.14¼	.21
"Resin V"	lb.	——	.13¾
"Rubtack"	lb.	——	.10
"Staybelite Esters" (dlvd.)	lb.	.15	.23¾
"Super-Beckacite No. 1001"	lb.	.37	.38
"Wilcorite R-30"	lb.	——	.40

THICKENERS (FOR LATEX)

"Acrysol GS"	lb.	.15	.22
"Betanol" (drums)	lb.	——	.70
"Emulsorex No. 5"	lb.	——	.35
Propylene Laurate (drums)	lb.	——	.36
Sodium Silicate	lb.	.01	.02

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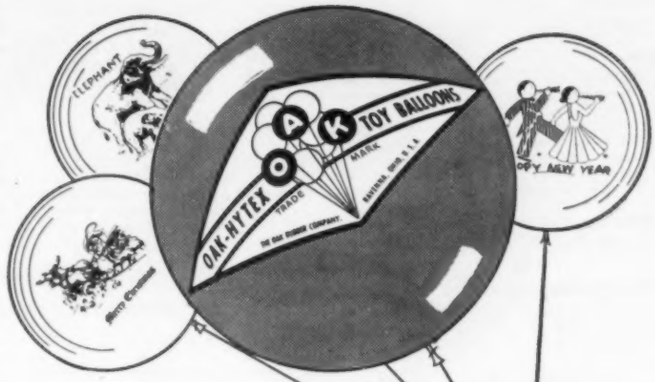

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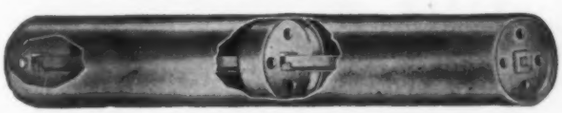

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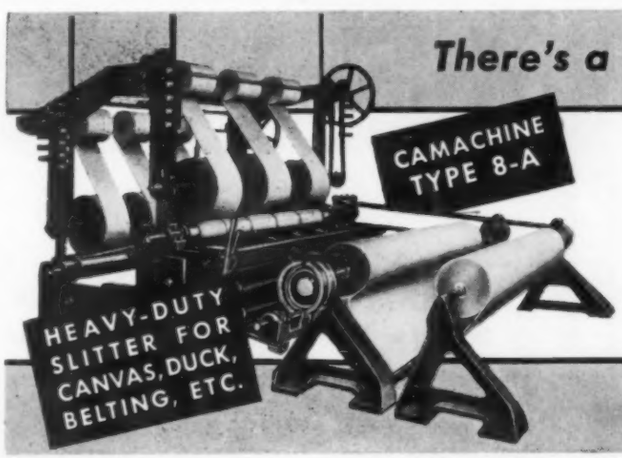

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Sulfur

"Crystex" (l.c.l.)	lb.	.32	-	.35
"Dispersed Sulfur"	lb.	—	-	.09
"No. 2"	lb.	.08	-	.12
"Devil" (c.l.)	cwt.	—	-	1.35
"Insoluble Sulfur 60"	lb.	—	-	.16
"Star" (c.l.)	cwt.	—	-	1.85
"Tire"	cwt.	1.35	-	2.05
"Tube" (c.l., dlvd.)	cwt.	—	-	2.40

Tellurium

"Latex Telloy"	lb.	—	-	1.75
"Telloy"	lb.	—	-	1.75

Miscellaneous Vulcanizing Agents

"VA-3"	lb.	.55	-	.65
"Vultac No. 1"	lb.	.38	-	.45
"No. 2"	lb.	.38	-	.45
"No. 3"	lb.	.42	-	.49

WASHING & FINISHING AGENTS

"Apcolene" (t.c.)	gal.	—	-	.08½
"Washine"	gal.	.20	-	.30

WETTING AGENTS

"Advawet No. 15"	lb.	—	-	.18
"No. 33"	lb.	—	-	.43
"Aerosol OT 70% Clear"	lb.	.80	-	1.00
"Agchem SA-15" ("16, 18")	lb.	.17	-	.29
"Aquarex BBX Conc." (dlvd.)	lb.	—	-	.76
"D" (dlvd.)	lb.	—	-	.60
"ME" (dlvd.)	lb.	—	-	.82
"NS" (dlvd.)	lb.	—	-	.75
"Areskap 50"	lb.	.18	-	.24
"Dry 100"	lb.	.39	-	.51
"Aresket 240"	lb.	.16	-	.22
"Dry 300"	lb.	.42	-	.50
"Aresklene 375"	lb.	.35	-	.50
"Dry 400"	lb.	.51	-	.65
Lecithin	lb.	—	-	.26
"Santomerse D"	lb.	.41	-	.65
"S"	lb.	.11	-	.25
"Stablex G"	lb.	—	-	.70
"Triton K-60"	lb.	.29	-	.36
"N-100"	lb.	1.00	-	1.07
"720"	lb.	.26	-	.33
"770"	lb.	.14¾	-	.22
"Yelkin C"	lb.	—	-	55

MISCELLANEOUS CHEMICALS

"Acto 450" ("550-W," "600," "630")	lb.	.09¾	-	.11¾
"Agchem SA-17"	lb.	—	-	.29
"Aquarex SMO" (dlvd.)	lb.	—	-	.40
"A.S.T.M. Oil No. 1" (and "No. 3")	gal.	1.00	-	1.15
"Black-Out"	gal.	4.50	-	8.00
2-Ethylhexanol (dms., dlvd.)	lb.	.25	-	.26
Glycerine, 88% Sap., Crude (dlvd.)	lb.	.14	-	.14½
"Hydrozo"	lb.	—	-	.51
"MODX" (tons)	lb.	—	-	.29½
"Para Resin No. 1784"	lb.	—	-	.09¾
"No. 2457"	lb.	—	-	.04
"No. 2718"	lb.	—	-	.04
"Resin No. 1226"	lb.	.31½	-	.36½
Resorcinol (dlvd.)	lb.	—	-	.64
"Rio Resin"	lb.	.36	-	.38
"Santocel"	lb.	—	-	.50
"Sublac"	lb.	.25	-	.27
"Synpep N" (drums)	lb.	—	-	.54
"Tysonite"	lb.	.16½	-	.17¼
"Vinsol Resin"—Lumps (dlvd.)	lb.	.02½	-	.03 *
Pulverized (dlvd.)	lb.	.02½	-	.03½ *

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FACTORY MANAGER, 20 years' technical and practical experience in the rubber industry from laboratory development to factory production. A broad knowledge of compounding, mixing, milling, calendering, spreading, extruding, and curing in the processing of natural and synthetic rubber and plastic resin in many phases of the finished product. Address Box 2267, RUBBER AGE.

WASHINGTON REPRESENTATIVE, wide business, public relations, and association experience. Splendid references. Full or part time or special assignment. Address 4853 CRESCENT ST., WASHINGTON 16, D. C.

RUBBER CHEMIST, 5 years' experience in compounding, research, and factory processing of natural and synthetic rubber, and plastics for the wire and cable, and tire industries. Desires responsible position combining research with factory problems. Location immaterial. Address Box 2271, RUBBER AGE.

CHEMIST, 33, with 6 years' experience in formulation and production of solvent and latex cements, lacquers, pressure-sensitive compounds, seeks responsible position in production and/or sales service. Eastern location preferred. Address Box 2277, RUBBER AGE.

RUBBER CHEMIST, Ph.D., desires position where 40 years of both European and American experience in research, development, and manufacture can be utilized. Address Box 2279, RUBBER AGE.

OPPORTUNE TIME for medium or small manufacturer in the adhesive tape industry to secure services of thoroughly competent chief chemist to build up his pressure-sensitive tape production (applied on cloth, paper, film, or any material) and laminated products business, by offering me employment contract as manager. Salary $400 per month. Address Box 2280, RUBBER AGE.

PURCHASING AGENT'S position sought. Twenty years' foreign and domestic experience buying and selling crude rubber and various products, also foreign sales representative for large American rubber manufacturers; familiar with foreign and domestic markets. Excellent references. Address Box 2282, RUBBER AGE.

SALESMAN, mechanical rubber goods, 9 years' experience selling hose, belting, packing, molded goods, wishes to represent rubber factory in exclusive territory. Commission basis preferred or will travel as special representative. Own car. Address Box 2284, RUBBER AGE.

YOUNG RUBBER CHEMIST, 6 years' experience in factory compounding, processing, and development. Particularly interested in joining a small company which needs a young, energetic, ambitious technician of limited capital as a member of the firm. Address Box 2288, RUBBER AGE.

CHEMICAL ENGINEER, 26. 3 years' extensive product development, coatings, adhesives, saturants with water emulsions and solvent solutions of synthetic, natural, and reclaimed rubber; resin coatings; sales servicing. Address Box 2289, RUBBER AGE.

FACTORY MANAGER, thorough knowledge quality control, development, experienced compounder. Permanent position as Manager or Chief Chemist in rubber or plastic extrusion plant desired. Under 40, employed, family. A-1 references from top employers. Locate anywhere. Address Box 2291, RUBBER AGE.

RUBBER CHEMIST, 34 years of age, Ch.E., 12 years' experience as chief chemist, factory supervisor, technical salesman. Know tire, wire, mechanical compounding. Will represent top grade company as technical sales representative. Have staff and space in concentrated rubber area but willing to change location for right offer. Address Box 2295, RUBBER AGE.

SUPERVISOR and practical rubber man, age 38, 21 years in rubber and synthetic rubber compounding, mixing, extruding, calendering, and molding of mechanical rubber goods. Address Box 2293, RUBBER AGE.

DEVELOPMENT CHEMIST—EXECUTIVE. Research and development chemist, 10 years' extensive experience resins, rubbers, thermoplastics, adhesives, desires responsible position progressive growing company, New England. Consulting work considered. Address Box 2296, RUBBER AGE.

CHEMICAL SALES. Man, 28, with experience in selling to rubber industry, desires position in Eastern territory. Address Box 2297, RUBBER AGE.

TECHNICAL SALES, graduate chemist, extensive experience with textile coatings, rubber and latex compounding ingredients, adhesives, dispersions, etc. Presently employed. East preferred. Address Box 2298, RUBBER AGE.

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Long-established manufacturer in New York City requires competent supervisor for rubber department. Knowledge of rubber mixing, milling, tubing, molding, vulcanizing, cutting operations and equipment essential. In application state age, education, experience and compensation expected. Excellent opportunity for an aggressive, conscientious man who values permanent, steady employment.

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RUBBER TECHNOLOGIST: Graduate chemist or chemical engineer with compounding and production control experience on crude and synthetic mechanical goods or belts. Excellent opportunity for the right man in an established progressive company of about 1,000 employees. In reply give experience, education, age, and salary expected. Address Box 2272, RUBBER AGE.

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Experienced in the development and production of automotive natural and synthetic rubber cements and sealers. An excellent opportunity with a growing concern for a man who can carry out his own development program. State education, experience, availability and salary requirements. Address Box 2276, RUBBER AGE.

ASSISTANT TO CHIEF CHEMIST who has had experience in compounding natural and synthetic rubbers for molded and wrapped goods, including rubber covered rolls. Small plant; western Pennsylvania. Address Box 2278, RUBBER AGE.

MASTER MECHANIC, must have long experience in rubber industry. Write fully, stating experience, salary expected, etc. Address Box 2283, RUBBER AGE.

DEVELOPMENT CHEMIST, young, with several years' experience in rubber industry for development work on synthetic rubbers, adhesives, plastics used in fabric coatings. Excellent opportunity. Metropolitan New York area. In reply give complete resume and minimum salary requirements. Enclose small photo. Address Box 2285, RUBBER AGE.

CHEMIST, experienced in rubber industry for development work on synthetic rubber and calendered plastics. Metropolitan New York area. State age, education, experience, including previous and present employment, and minimum salary requirements. Address Box 2286, RUBBER AGE.

CALENDER AND MILL ROOM FOREMAN. Knowledge of calendering rubber, synthetic rubber sheets and fabric coating essential. Steady position. Plant located in Rhode Island. Address Box 2287, RUBBER AGE.

WANTED: A college graduate in either chemistry or mechanical engineering with at least 6 years' experience in the rubber industry for the engineering development division of an Eastern rubber manufacturer. Applicant must be familiar with rubber processing and molding practices. Position calls for a man who has ideas of his own and is able in due time to take over the supervision and direction of this department. Applicant is asked to give details as to education, age, business experience, and salary desired. Address Box 2266, RUBBER AGE.

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WANTED: 4 Roll Calender, 24" x 72", and other large Rubber Equipment for use by large plastic manufacturer. Address Box 2273, RUBBER AGE.

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